CH2M HILL
1748 West Truck Road
Otis ANGB, MA 02542

29 March 2013

Mr. Jonathan S. Davis
Remediation Program Manager
HQ AFCEC/MMR
322 E. Inner Road
Otis ANG Base, MA 02542-5028

SUBJECT: AFCEC 4P08 FA8903-08-D-8769; Task Order 0337
MMR SPEIM/LTM/O&M Program
CDRL #A001j
Fuel Spill-28 2012 Summary Letter Report

Dear Mr. Davis:

The purpose of this Summary Letter Report (SLR) is to document the results of sampling activities conducted at the Fuel Spill-28 (FS-28) plume under the System Performance and Ecological Impact Monitoring (SPEIM) program during the 2012 calendar year. This deliverable contains no detailed assessment or evaluation of the results, but is a means of documenting all the actions completed under the FS-28 SPEIM program. The data collected under the SPEIM program are continually assessed and the results of these assessments are presented initially during the Technical Update Meetings and then through Technical Memoranda or Project Note deliverables, if warranted, based on the results of the data evaluation or to address particular plume issues.

In October 2012, the Air Force Center for Engineering and the Environment (AFCEE) adopted a new organizational name, the Air Force Civil Engineer Center (AFCEC). Therefore, the AFCEE and AFCEC acronyms refer to the same entity, but are used in this document in relation to the date of a specific topic or document.

This letter report includes a summary of the activities performed and the data collected for the FS-28 SPEIM program between 01 January 2012 and 31 December 2012. The FS-28 plume is defined as the extent of groundwater contaminated with ethylene dibromide (EDB), the FS-28 plume contaminant of concern (COC), at concentrations exceeding the Massachusetts Maximum Contaminant Level (MMCL) of 0.02 micrograms per liter (µg/L). The FS-28 extraction, treatment, and discharge (ETD) system was designed to treat a maximum of 750 gallons per minute (gpm). At the time of system startup on 14 October 1997, the ETD system consisted of one extraction well (69EW0001) with the goal of remediating the northern portion of the plume. On 06 April 1999, the remedial system was expanded with the startup of a shallow wellpoint (SWP) system which consisted of an array of 204 wellpoints operating at 350 gpm. The SWP system was installed to intercept shallow EDB-contaminated groundwater before it

discharged to the Coonamessett River or associated cranberry bogs. During 2007, the FS-28 ETD system was further expanded through the installation of a second extraction well (69EW0002) to remediate a deeper leading edge lobe of the plume identified to the south of both 69EW0001 and the SWP system. Extraction well 69EW0002 came on-line on 11 December 2007. The extracted water is conveyed to the FS-28 treatment plant where it is treated by a granular activated carbon (GAC) system and discharged to the Coonamessett River via two vertical riser pipes (i.e., bubblers). The FS-28 plume and treatment system are presented in **Figure 1**.

On 07 November 2008, the SWP system was shutdown for an interim period while data gap investigative activities were being conducted (AFCEE 2009). The outcome of the 2008/2009 data gap investigation and optimization evaluation concluded that although the SWP system had been successful in remediating the FS-28 plume in this area, it was no longer effective in remediating the remaining residual EDB contamination near the SWPs. Consequently, the system was permanently shutdown on 25 February 2010 and decommissioned by February 2011 (AFCEE 2012b).

During 2012, the FS-28 ETD system operated at a total flow rate of 625 gpm (550 gpm extracted at 69EW0001 and 75 gpm at 69EW0002) through 22 August 2012; flow at 69EW0002 was returned to the original design rate of 50 gpm based on a review of monitoring data collected near 69EW0002 (AFCEC 2012).

AFCEE installed the FS-28 ETD system (including 69EW0001 and the SWP system) under time critical and non-time critical actions which became the selected alternative in the Final Record of Decision (ROD) (AFCEE 2000). The FS-28 remedial system has been modified since the ROD was signed in 2000 through the addition of extraction well 69EW0002 in 2007. This modification was not considered significant since the modifications were consistent with the cleanup strategy outlined in the 2000 ROD. A Final Explanation of Significant Differences (ESD) was submitted in September 2008 to document the planned land use control (LUC) process at FS-28 and to update the three-step process (AFCEE 2008). A second ESD was submitted in September 2011 that clarified the inclusion of monitored natural attenuation as a component of the selected remedy, slightly modified the phrasing of the remedial action objectives, and updated the steps to achieve site closure (i.e., the three-step process) (AFCEE 2011).

FS-28 SPEIM ACTIVITIES

The SPEIM program was developed to monitor plume changes and to ensure the effective operation of the AFCEC groundwater remediation systems at Massachusetts Military Reservation (MMR). These objectives are met through the monitoring of selected media (i.e., groundwater, surface water) within and outside the plume boundaries, treatment plant monitoring, and groundwater flow and transport modeling. Activities completed for the FS-28 SPEIM program during 2012 include the following:

SPEIM Sampling Activities:

- Triennial groundwater sampling (January/February 2012).
- Surface water sampling at the Coonamessett River during the cranberry growing season (June 2012 and August 2012).

- Annual sampling of the Coonamessett Water Supply Well (CWSW) sentry well (October 2012).
- Monthly treatment system sampling (January 2012 through December 2012).
- Recording of daily average treatment system flow rates (January 2012 through December 2012).
- LUC Program private well sampling.

Groundwater and surface water locations sampled for the FS-28 SPEIM program in 2012 are presented in **Figure 2** and **Figure 3**, respectively. The well construction and surface water location information is included in **Table 1**. The current approved FS-28 SPEIM network is presented in the *Comprehensive Long Term Monitoring Plan*, which is available from AFCEC.

Groundwater analytical results are presented in **Table 2**. A map showing the distribution of EDB detections in groundwater in 2012 is included as **Figure 4**. **Table 3** contains the surface water analytical results. A comparison of compounds detected during 2012 in groundwater and treatment plant samples to applicable standards is included in **Attachment A**.

Data Summary Report:

The data summary report for the analytical data reported in this SLR is included in **Attachment B**.

Presentations:

Presentations for the FS-28 plume are listed in **Table 4**.

Project Note Submittals:

The project note related to activities conducted for the FS-28 plume under the SPEIM program in 2012 is included in **Attachment C**.

Report Submittals:

- *Fuel Spill-28 2011 Summary Letter Report* submitted in March 2012 (AFCEE 2012b).
- *Final 2011 MMR Vapor Intrusion Evaluation Technical Memorandum* submitted in August 2012 (AFCEE 2012a).
- *Fuel Spill-28 and Southwest Plumes 2011 Private Well Verification and Well Determination Project Note* in February 2012 (AFCEE 2012c)
- Annual data transmittal of the monitoring results for the Coonamessett Water Supply Well sentry well submitted in November 2012.

Major Events and Optimizations:

Optimization activities are completed as part of the SPEIM program in order to improve the performance of the remedial systems and to improve the monitoring program. Monitoring data collected under the SPEIM program near 69EW0002 during 2011 and

2012 suggested the plume width had decreased and the flow rate at this well could be returned to its original design rate of 50 gpm from 75 gpm. This flow rate adjustment was made on 22 August 2012 (see *Fuel Spill-28 2012 Triennial SPEIM Data Presentation Project Note* in **Attachment C** for more details).

The FS-28 SPEIM chemical monitoring network was optimized during 2012 (AFCEC 2012). The optimization resulted in removing redundant or inappropriately placed wells throughout the plume area, reducing monitoring in the area upgradient of where the plume is currently delineated, and adjusting monitoring frequencies so groundwater sampling is conducted either annually or triennially. Overall, the optimization resulted in an approximate 34 percent decrease in the groundwater monitoring program at FS-28 (reduction from 51 to 34 groundwater samples collected on an annualized basis).

As part of an optimization evaluation, AFCEC purchased a 20,000-pound (lb) load of virgin coconut shell-based GAC for use in a comparative test of performance at the FS-28 treatment system. This GAC bed was installed on 19 October 2011 and was moved to the lead position on 18 January 2012. As of February 2013, this load is still in service in the lead position. This is a current lead bed service life of approximately 13 months. The average lead bed service life of reactivated coal-based GAC at FS-28 is approximately 2.8 months. Therefore, the testing indicates that the virgin coconut shell-based product has a much higher adsorption capacity for EDB than the reactivated coal-based product, resulting in a longer service life. The final results of this GAC optimization evaluation will be reported in a project note during 2013.

FS-28 REMEDIAL STATUS UPDATE

Analytical results for samples collected at the FS-28 treatment system are presented in **Table 5**. Average weekly flow rates for the FS-28 extraction wells are presented in **Table 6**. Treatment system operational downtimes or deviations (for events lasting two hours or longer) between January 2012 and December 2012 are summarized in **Table 7**. Mass removal calculations through December 2012 for the FS-28 treatment system are presented in **Table 8**.

The most recent plume shell for the FS-28 plume included data collected through June 2006 (AFCEE 2007). The 2006 FS-28 EDB plume shell is estimated to contain approximately 1.8 billion gallons of contaminated groundwater and 4.8 lbs of dissolved-phase EDB at concentrations above the MMCL.

The FS-28 ETD system removed approximately 0.144 lbs of EDB between January 2012 and December 2012. During this period, approximately 300 million gallons of groundwater were treated at the FS-28 plant. Since system startup in October 1997, the system has removed approximately 14.83 lbs of EDB through the treatment of approximately 5.2 billion gallons of groundwater.

The operation of the FS-28 remedial system used approximately 377 megawatt hours of electricity during 2012. Power plant air emissions associated with this power generation for 2012 and since system startup in October 1997 are presented in **Table 9**. Green energy purchases and power production from AFCEC's wind turbines are incorporated into these air emissions data.

The FS-28 remedial system is currently operating according to the 2012 Scenario 01 pumping configuration; 69EW0001 at 550 gpm and 69EW0002 at 50 gpm. Groundwater transport modeling conducted in 2004 indicates that EDB at concentrations above the MMCL will be present in the main body of the FS-28 plume (i.e., north of 69EW0001) through approximately 2047 (AFCEE 2004). It should be noted that the FS-28 plume shell was not updated during 2012 and that groundwater transport modeling was not performed during 2012. Due to the complexity of the hydrogeology in the area of the leading edge lobes (south of 69EW0001), the groundwater model will not be used to assess the fate and transport of this portion of the FS-28 plume. Rather, monitoring data collected under the SPEIM program will be used to evaluate the remedial system performance and to identify optimization opportunities for this lobe of the FS-28 plume. Through the SPEIM program, the Conceptual Site Model is routinely updated and the remedial system operation is continuously evaluated and optimized to reduce cleanup times, therefore the predicted timeframes presented in this section will most likely be decreased in future scenarios.

FS-28 SPEIM ACTIVITIES PLANNED FOR 2013

Activities currently planned for the FS-28 SPEIM program for 2013 include the following:

- Annual (January 2013) groundwater sampling.
- Annual sampling of the CWSW sentry well (October 2013).
- Coonamessett River surface water and irrigation system sampling during the 2013 cranberry growing season (June and August).
- Monitoring network and ETD system optimization evaluations (when appropriate).
- Synoptic water level measurements (as needed).
- FS-28 SPEIM data presentations.
- Update and submit the *FS-28 Groundwater Plume Conceptual Site Model* deliverable.
- Monthly treatment system sampling (January 2013 through December 2013).
- Recording of daily average treatment system flow rates (January 2013 through December 2013).
- LUC Program private well verification surveys and sampling (as needed).
- Completion of the coconut GAC performance evaluation and project note.

Mr. Jon Davis is the Air Force point of contact for this project and can be reached at (508) 968-4670, extension 4952.

Sincerely,

CH2M HILL

Nigel Tindall, P.G.
Project Manager

Attachments:

Figure 1	FS-28 Groundwater Plume and Treatment System
Figure 2	FS-28 Groundwater Monitoring Locations
Figure 3	FS-28 Surface Water Monitoring Locations
Figure 4	FS-28 2012 Ethylene Dibromide Detections in Groundwater
Table 1	FS-28 Well Construction and Surface Water Sampling Location Information
Table 2	FS-28 Groundwater Monitoring Results
Table 3	FS-28 Surface Water Monitoring Results
Table 4	FS-28 Meeting Presentations
Table 5	FS-28 Treatment Plant Sampling Results
Table 6	FS-28 Treatment System Flow Rates
Table 7	FS-28 Treatment System Downtime Summary
Table 8	FS-28 Treatment System Mass Removal Summary
Table 9	FS-28 Remedial System Electrical Consumption and Associated Air Emissions
Attachment A	Comparison of Detected Concentrations in FS-28 Groundwater and Treatment Plant Samples to Applicable Groundwater Standards
Attachment B	FS-28 2012 SLR Data Summary Report
Attachment C	FS-28 Project Note

* c: Rose Forbes, AFCEC/MMR
Bob Lim, EPA
Leonard Pinaud, MassDEP
David Carignan, Falmouth BOH
Martha Steele, MassDPH
Steve Hurley, MDFW
Mark Kasprzyk, Cons. Comm
Heather Harper, Town of Falmouth
Fred Bottomley
David Nolte, Decas Cranberry Products
Brian Handy, Handy Cranberry Trust
Jeff LaFleur, CCCGA
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* Delivery via email.

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FIGURES

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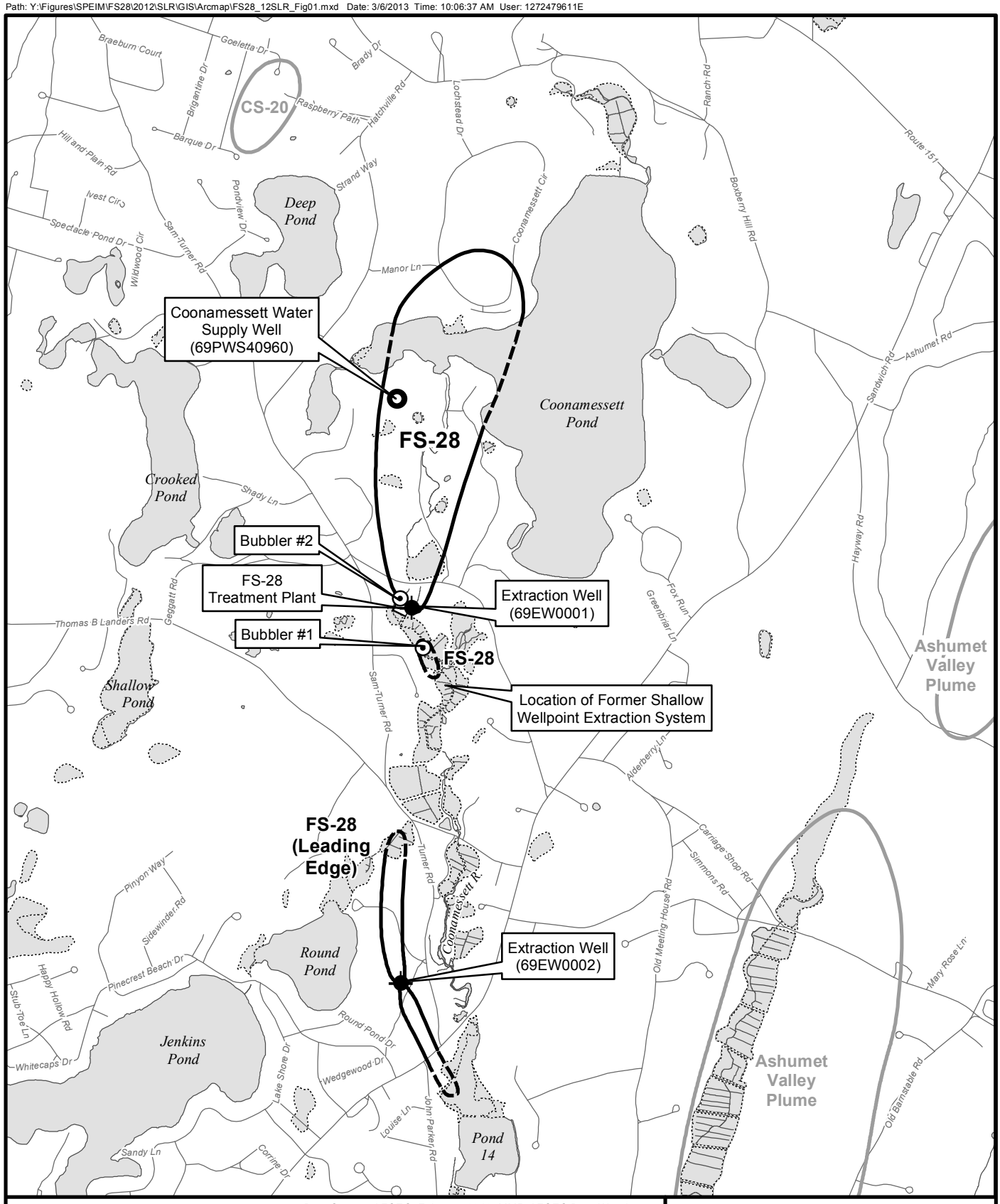

Legend

- Extraction Well
- Public Water Supply Well
- Bubbler
- Bog/Wetland
- Plume Boundary (Dashed Where Inferred)
- Other Plume Boundary (Dashed Where Inferred)

Data Source: AFCEC, February 2013, MMR-AFCEC Data Warehouse

N

0 800 1,600 Feet

FIGURE 1

FS-28 GROUNDWATER PLUME AND TREATMENT SYSTEM

AFCEC - Massachusetts Military Reservation

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69MW1416
69MW1272
69MW1411
69MW1401
69MW1400A
69MW1404
69MW1403
69PZ1403
69MW1275
69MW1279C
69MW1314
69MW1313
69MW1283A,B
69MW1315
69MW1316
69MW1310
69MW1304
69MW1312
69MW1311
69MW1284A,B
69MW1303A,B
69EW0001
69MW0034A
69MW1317A,B,C
69MW1290A,B
69MW1285A,B
69MW0033A
69MW1291B
69PZ1291A
69MW1296A
69MW1294
69MW1318A
69MW1297
69PZ0023A
69PZ1298A
69MW1300A,B
69PZ1300A
69MW1286,A
69PZ1286B
69MW1302
69PZ1302A
69MW1306A,C
69PZ1308A
69PZ0019B
69PZ0017A
69PZ0020A
69PZ0021A
69PZ0005B
69EW0002
69MW0030A
69MW0031A
69MW0029A,B
69MW0032A,B
69MW0028A

FS-28

Deep Pond
Crooked Pond
Shallow Pond
Coonamessett Pond
Round Pond
Jenkins Pond
Pond 14
Coonamessett River
Hidden Pond Wy
Hill and Plain Rd
Thomas B Landers Rd
Hatchville Rd
Sandwich Rd
Turner Rd
Boxberry Hill Rd

Data Source: AFCEC, February 2013, MMR-AFCEC Data Warehouse

Legend

- Monitoring Well
- Extraction Well
- Plume Boundary (Dashed Where Inferred)
- Bog/Wetland

N

0 460 920 Feet

FIGURE 2

FS-28 GROUNDWATER MONITORING LOCATIONS

AFCEC - Massachusetts Military Reservation

FS-28 2012 Summary Letter Report

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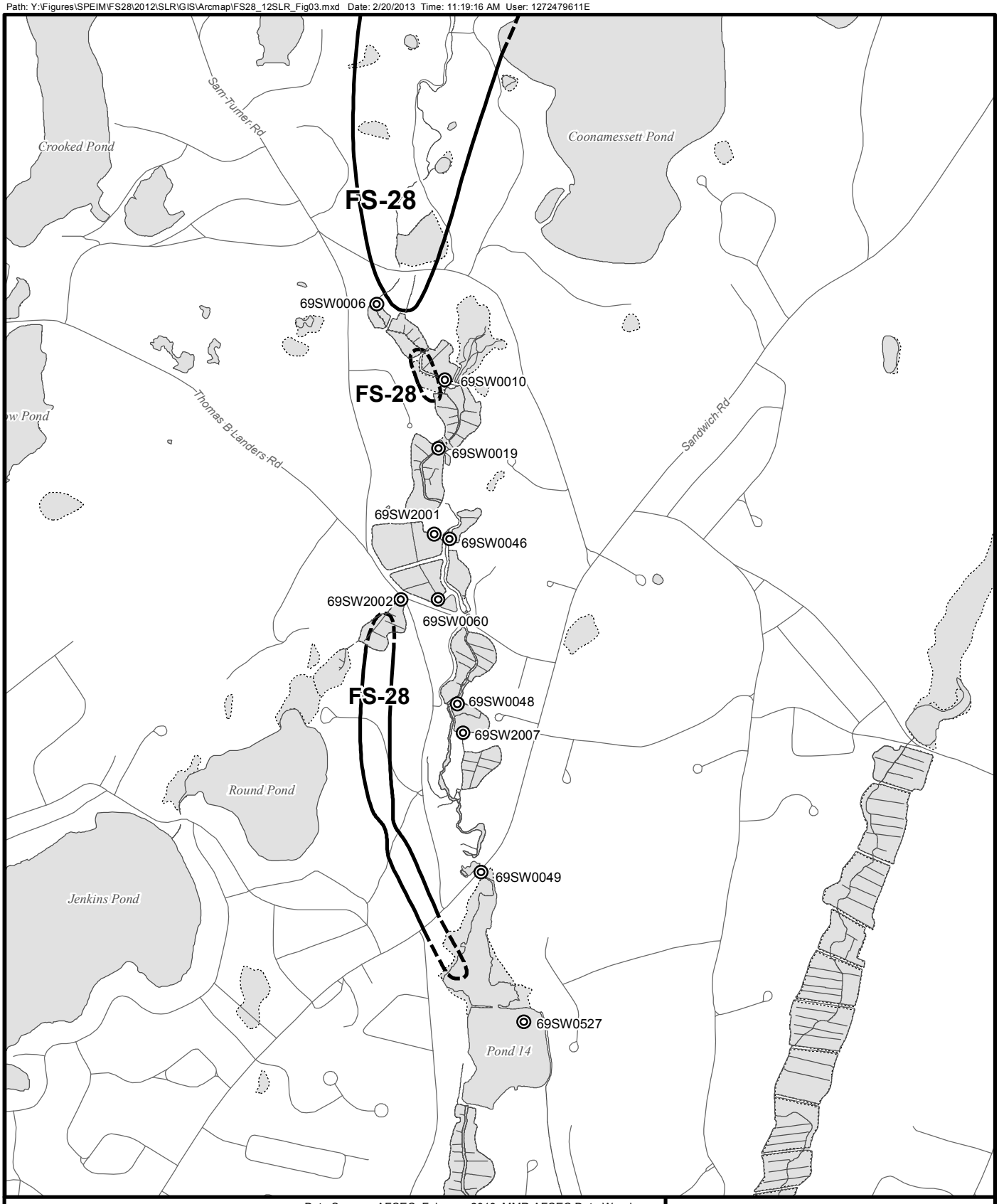

Data Source: AFCEC, February 2013, MMR-AFCEC Data Warehouse

Legend

- Surface Water Sampling Location
- Plume Boundary (Dashed Where Inferred)
- Bog/Wetland

N

0 570 1,140 Feet

FIGURE 3

FS-28 SURFACE WATER MONITORING LOCATIONS

AFCEC - Massachusetts Military Reservation

FS-28 2012 Summary Letter Report

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69MW1416
69MW1272
69MW1411
69MW1401
69MW1400A
69MW1404
69MW1403
69PZ1403
69MW1275
69MW1279C
69MW1314
69MW1278
69MW1313
69MW1315
69MW1283A,B
69MW1316
69MW1310
69MW1312
69MW1304
69MW1284A,B
69MW1311
69EW0001
69MW1303A,B
69MW1317A,B,C
69MW0034A
69MW1290A,B
69MW1285A,B
69MW0033A
69MW1296A
69PZ1291A
69MW1291B
69MW1294
69MW1318A
69MW1297
69MW1300A,B
69PZ1300A
69PZ0023A
69PZ1298A
69MW1286,A
69PZ1286B
69MW1302
69PZ1302A
69MW1306A,C
69PZ1308A
69PZ0019B
69PZ0017A
69PZ0021A
69PZ0020A
69PZ0005B
69EW0002
69MW0030A
69MW0031A
69MW0029A,B
69MW0032A,B
69MW0028A

FS-28

Deep Pond
Crooked Pond
Coonamessett Pond
Round Pond
Broad River
Jenkins Pond
Pond 14
Coonamessett River

Goelleta Dr
Braeburn Court
Brigantine Dr
Galleon Dr
Sloop Dr
Raspberry Path
Hatchville Rd
Lochstead Dr
Ranch Rd
Route 151
Barque Dr
Hill and Plain Rd
Strand Way
Coonamessett Cir
Boxberry Hill Rd
Ivest Cir
Ivest Dr
Highland Cir
Pondview Cir
Pondview Dr
Spectacle Pond Dr
Manor Ln
Deep Pond Rd
Chute Ln
Sam Turner Rd
Ashumet Rd
Hayway Rd
Shady Ln
Geggatt Rd
Waters Edge
Fox Run
Greenbriar Ln
Cranston Ln
Thomas B Landers Rd
Sandwich Rd
Blueberry Ln
Alderberry Ln
Hatchville Rd
Decosta Cir
Turner Rd
Captain Eldridge Way
Wagon Trail Rd
Carriage Shop Rd
Simmons Rd
Journeys End Rd
Rolling Acres Ln
Old Meeting House Rd
Bittersweet Rd
Cranberry Ln
Treetop Ln
Pinyon Way
Sidewinder Rd
Pinecrest Beach Dr
Lake Shore Dr North
Compass Cir
Whitecaps Dr
Round Pond Dr
Lake Shore Dr
Sunset Dr
Lakewood Dr
Wedgewood Dr
Carleton Cir
John Parker Rd

Legend

- Extraction Well
- Plume Boundary (Dashed Where Inferred)
- Bog/Wetland

Contaminant Detections in Groundwater:

- Detection Above MMCL
- Detection Below or At MMCL
- No Detection

Data Source: AFCEC, February 2013, MMR-AFCEC Data Warehouse

N

0 470 940 Feet

FIGURE 4

FS-28 2012 ETHYLENE DIBROMIDE DETECTIONS IN GROUNDWATER

AFCEC - Massachusetts Military Reservation

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TABLES

Table 1
FS-28 Well Construction and Surface Water Sampling Location Information
FS-28 2012 Summary Letter Report

Location	Northing (ft)	Easting (ft)	Surface Elevation (ft msl)	Measuring Point Elevation (ft msl)	Total Well Depth (ft bgs)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)
69EW0001	224250	853233	31	30.32	207	-149.22	-169.55	20.33*
69EW0002	219893	853102	40	33.85	302	-132.1	-172.1	40
69MW0028A	219006	853432	28	27.47	100	-66.99	-71.99	5
69MW0029A	219866	853116	39	38.95	171	-126.56	-131.56	5
69MW0029B	219867	853121	39	39.21	134	-89.85	-94.85	5
69MW0030A	219894	853183	39	38.74	130	-86.27	-91.27	5
69MW0031A	219848	853042	40	40.12	160	-114.32	-119.32	5
69MW0032A	219738	853143	47	46.14	178	-126.28	-131.28	5
69MW0032B	219743	853144	46	45.91	145	-93.59	-98.59	5
69MW0033A	223500	853476	28	27.53	25	7.92	2.92	5
69MW0034A	223807	853367	29	28.34	146	-111.90	-116.90	5
69MW1272	230454	854371	54	53.91	103	-43.79	-48.79	5
69MW1275	227823	853750	43	42.48	126	-78.24	-83.24	5
69MW1278	226256	853313	39	39.39	152	-107.81	-112.81	5
69MW1279C	226842	853287	47	49.12	155	-102.99	-107.99	5
69MW1283A	225500	853301	37	38.13	175	-133.50	-138.50	5
69MW1283B	225494	853297	36	38.46	225	-183.60	-188.60	5
69MW1284A	224304	853243	32	31.14	214	-177.50	-182.50	5
69MW1284B	224309	853238	32	31.44	250	-213.40	-218.40	5
69MW1285A	223533	853482	28	30.44	65	-31.90	-36.90	5
69MW1285B	223537	853484	28	30.49	185	-151.80	-156.80	5
69MW1286	221997	853115	28	27.19	185	-152.50	-157.50	5
69MW1286A	221996	853110	28	27.20	132	-99.74	-104.74	5
69MW1290A	223740	852899	59	59.08	240	-175.60	-180.60	5
69MW1290B	223739	852899	59	59.08	294	-229.60	-234.60	5
69MW1291B	223258	853555	29	28.52	161	-125.90	-130.90	5
69MW1294	223074	853542	24	28.09	45	-15.80	-20.80	5
69MW1296A	223257	853264	38	37.98	185	-141.15	-146.15	5
69MW1297	222436	853062	30	29.22	150	-115.40	-120.40	5
69MW1300A	222044	853273	26	25.79	33	1.20	-3.80	5
69MW1300B	222043	853269	26	25.52	105	-73.90	-78.90	5
69MW1302	221809	853273	27	26.35	105	-73.30	-78.30	5
69MW1303A	224117	853292	31	30.68	209	-171.80	-176.80	5
69MW1303B	224123	853284	31	30.94	250	-211.60	-218.30	7
69MW1304	224480	853179	35	36.84	218	-178.50	-183.50	5
69MW1306A	221775	853148	26	28.38	110	-79.24	-84.24	5
69MW1306C	221772	853145	26	25.48	147	-115.27	-120.27	5
69MW1310	225029	853565	33	32.88	240	-197.20	-207.20	10
69MW1311	224307	852781	61	60.97	240	-169.00	-174.00	5
69MW1312	224590	853854	44	44.22	200	-150.59	-155.59	5
69MW1313	225810	854197	71	70.58	220	-144.09	-149.09	5
69MW1314	226772	853909	70	70.03	280	-204.63	-209.63	5
69MW1315	225364	852764	59	59.03	238	-173.70	-178.70	5
69MW1316	225201	852431	52	51.61	245	-188.05	-193.05	5
69MW1317A	223919	853494	31	30.22	175	-139.44	-144.44	5
69MW1317B	223931	853501	31	30.34	144	-108.23	-113.05	5
69MW1317C	223920	853499	31	30.22	93	-57.20	-62.20	5
69MW1318A	222810	853276	28	27.03	160	-127.48	-132.48	5
69MW1400A	228652	853906	46	45.40	155	-104.37	-109.37	5
69MW1401	229230	854128	48	47.16	160	-107.32	-112.32	5
69MW1403	227788	854325	62	61.84	220	-152.94	-157.94	5
69MW1404	227893	852635	68	67.16	110	-37.35	-42.35	5
69MW1411	229668	855009	89	87.97	225	-131.42	-136.42	5
69MW1416	230528	853029	77	76.69	125	-42.92	-47.92	5
69PZ0005B	220066	853420	26	25.78	45	-13.95	-18.95	5
69PZ0017A	220736	853018	46	45.60	182	-131.28	-136.28	5
69PZ0019B	220933	853452	28	27.46	43	-10.23	-15.23	5
69PZ0020A	220237	852802	64	63.44	181	-112.72	-117.72	5
69PZ0021A	220251	853154	34	34.13	162	-122.41	-127.41	5
69PZ0023A	222164	852914	35	34.34	175	-135.55	-140.55	5
69PZ1286B	221997	853115	27	27.11	100	-67.54	-72.54	5

Table 1
FS-28 Well Construction and Surface Water Sampling Location Information
FS-28 2012 Summary Letter Report

Location	Northing (ft)	Easting (ft)	Surface Elevation (ft msl)	Measuring Point Elevation (ft msl)	Total Well Depth (ft bgs)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)
69PZ1291A	223262	853552	29	28.83	15	19.03	14.03	5
69PZ1298A	222092	853423	27	26.20	20	11.56	6.56	5
69PZ1300A	222044	853273	26	25.79	20	11.16	6.16	5
69PZ1302A	221808	853273	27	26.35	20	11.66	6.66	5
69PZ1308A	221764	853376	27	26.51	15	17.11	12.11	5
69PZ1403	227788	854325	62	61.90	160	-92.94	-97.94	5
69SW0006	224248	853012	N/A	N/A	N/A	N/A	N/A	N/A
69SW0010	223613	853584	N/A	N/A	N/A	N/A	N/A	N/A
69SW0019	223033	853534	N/A	N/A	N/A	N/A	N/A	N/A
69SW0046	222272	853626	N/A	N/A	N/A	N/A	N/A	N/A
69SW0048	220889	853688	N/A	N/A	N/A	N/A	N/A	N/A
69SW0049	219473	853890	N/A	N/A	N/A	N/A	N/A	N/A
69SW0060	221766	853529	N/A	N/A	N/A	N/A	N/A	N/A
69SW0527	218217	854248	N/A	N/A	N/A	N/A	N/A	N/A
69SW2001	222314	853493	N/A	N/A	N/A	N/A	N/A	N/A
69SW2002	221764	853216	N/A	N/A	N/A	N/A	N/A	N/A
69SW2007	220644	853739	N/A	N/A	N/A	N/A	N/A	N/A

Data Source: AFCEC, February 2013, MMR-AFCEC Data Warehouse

Note:
* Extraction well screen length shortened on 11 June 2009 through installation of packers as a result of optimization.

Key:
bgs = below ground surface
FS-28 = Fuel Spill-28
ft = feet
msl = mean sea level
N/A = not applicable

Table 2
FS-28 Groundwater Monitoring Results
FS-28 2012 Summary Letter Report

Location	Date	Laboratory Analyses	Water Quality Parameters					
		EDB (µg/L) MMCL[1] = 0.02	Temp (°C)	pH (std)	DO (mg/L)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69EW0001	1/30/2012	**0.075**	*	*	*	*	*	*
69EW0001	2/27/2012	**0.079**	*	*	*	*	*	*
69EW0001	3/27/2012	**0.100**	*	*	*	*	*	*
69EW0001	4/26/2012	**0.075**	*	*	*	*	*	*
69EW0001	5/29/2012	**0.065**	11.23	5.89	4.18	75	170.8	0.0
69EW0001	6/26/2012	**0.068**	*	*	*	*	*	*
69EW0001	7/18/2012	**0.065**	*	*	*	*	*	*
69EW0001	8/28/2012	**0.058**	*	*	*	*	*	*
69EW0001	9/27/2012	**0.057**	*	*	*	*	*	*
69EW0001	10/25/2012	**0.044**	*	*	*	*	*	*
69EW0001	11/28/2012	**0.045**	11.38	6.65	4.3	71	185.5	0.0
69EW0001	12/26/2012	**0.039**	*	*	*	*	*	*
69EW0002	1/30/2012	0.019	*	*	*	*	*	*
69EW0002	2/27/2012	0.020	*	*	*	*	*	*
69EW0002	3/27/2012	**0.021**	*	*	*	*	*	*
69EW0002	4/26/2012	0.016	*	*	*	*	*	*
69EW0002	5/29/2012	0.018	12.09	6.58	2.88	74	137.7	0.0
69EW0002	6/26/2012	0.015	*	*	*	*	*	*
69EW0002	7/18/2012	0.017	*	*	*	*	*	*
69EW0002	8/28/2012	0.015	*	*	*	*	*	*
69EW0002	9/27/2012	0.014	*	*	*	*	*	*
69EW0002	10/25/2012	0.014	*	*	*	*	*	*
69EW0002	11/28/2012	0.012	10.50	6.83	1.71	72	150.9	0.0
69EW0002	12/26/2012	0.012	*	*	*	*	*	*
69MW0028A	2/15/2012	ND	--	--	--	--	--	--
69MW0029A	2/15/2012	ND	--	--	--	--	--	--
69MW0029B	2/15/2012	ND	--	--	--	--	--	--
69MW0030A	2/15/2012	ND	--	--	--	--	--	--
69MW0031A	2/15/2012	ND	--	--	--	--	--	--
69MW0032A	2/15/2012	ND	--	--	--	--	--	--
69MW0032B	2/15/2012	ND	--	--	--	--	--	--
69MW0033A	2/7/2012	BRL	--	--	--	--	--	--
69MW0034A	2/16/2012	0.017	--	--	--	--	--	--
69MW1272	2/14/2012	ND	--	--	--	--	--	--
69MW1275	2/16/2012	ND	--	--	--	--	--	--
69MW1278	2/2/2012	ND	--	--	--	--	--	--
69MW1279C	10/4/2012	ND	--	--	--	--	--	--
69MW1283A	2/2/2012	**0.425**	--	--	--	--	--	--
69MW1283B	2/2/2012	**0.933**	--	--	--	--	--	--
69MW1284A	2/2/2012	**0.267**	--	--	--	--	--	--
69MW1284B	2/29/2012	**0.786**	--	--	--	--	--	--
69MW1285A	2/7/2012	ND	--	--	--	--	--	--
69MW1285B	2/7/2012	ND	--	--	--	--	--	--
69MW1286	2/9/2012	ND	--	--	--	--	--	--
69MW1286A	2/1/2012	ND	--	--	--	--	--	--
69MW1290A	1/31/2012	ND	--	--	--	--	--	--
69MW1290B	1/31/2012	ND	--	--	--	--	--	--
69MW1291B	2/7/2012	ND	--	--	--	--	--	--
69MW1294	2/9/2012	ND	--	--	--	--	--	--
69MW1296A	1/31/2012	ND	--	--	--	--	--	--
69MW1297	2/1/2012	ND	--	--	--	--	--	--
69MW1300A	2/1/2012	BRL	--	--	--	--	--	--
69MW1300B	2/1/2012	ND	--	--	--	--	--	--
69MW1302	2/1/2012	ND	--	--	--	--	--	--
69MW1303A	2/7/2012	ND	--	--	--	--	--	--
69MW1303B	2/7/2012	ND	--	--	--	--	--	--

Table 2
FS-28 Groundwater Monitoring Results
FS-28 2012 Summary Letter Report

Location	Date	Laboratory Analyses	Water Quality Parameters					
		EDB (µg/L) MMCL[1] = 0.02	Temp (°C)	pH (std)	DO (mg/L)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69MW1304	2/2/2012	**0.859**	--	--	--	--	--	--
69MW1306A	2/9/2012	BRL	--	--	--	--	--	--
69MW1306C	2/9/2012	ND	--	--	--	--	--	--
69MW1310	2/2/2012	**0.032 J**	--	--	--	--	--	--
69MW1311	1/31/2012	ND	--	--	--	--	--	--
69MW1312	1/31/2012	ND	--	--	--	--	--	--
69MW1313	2/9/2012	ND	--	--	--	--	--	--
69MW1314	2/9/2012	**0.046**	--	--	--	--	--	--
69MW1315	2/16/2012	ND	--	--	--	--	--	--
69MW1316	1/31/2012	ND	--	--	--	--	--	--
69MW1317A	2/7/2012	ND	--	--	--	--	--	--
69MW1317B	2/7/2012	ND	--	--	--	--	--	--
69MW1317C	2/7/2012	ND	--	--	--	--	--	--
69MW1318A	2/9/2012	ND	--	--	--	--	--	--
69MW1400A	2/14/2012	ND	--	--	--	--	--	--
69MW1401	2/14/2012	ND	--	--	--	--	--	--
69MW1403	2/14/2012	ND	--	--	--	--	--	--
69MW1404	2/16/2012	ND	--	--	--	--	--	--
69MW1411	2/29/2012	ND	--	--	--	--	--	--
69MW1416	2/9/2012	ND	--	--	--	--	--	--
69PZ0005B	2/15/2012	ND	--	--	--	--	--	--
69PZ0017A	2/13/2012	ND	--	--	--	--	--	--
69PZ0019B	2/13/2012	ND	--	--	--	--	--	--
69PZ0020A	2/13/2012	ND	--	--	--	--	--	--
69PZ0021A	2/13/2012	ND	--	--	--	--	--	--
69PZ0023A	2/29/2012	ND	--	--	--	--	--	--
69PZ1286B	2/1/2012	ND	--	--	--	--	--	--
69PZ1291A	2/29/2012	ND	10.48	5.85	1.42	131	8.2	11.7
69PZ1298A	2/16/2012	ND	--	--	--	--	--	--
69PZ1300A	2/29/2012	ND	--	--	--	--	--	--
69PZ1302A	2/29/2012	ND	--	--	--	--	--	--
69PZ1308A	2/16/2012	ND	--	--	--	--	--	--
69PZ1403	2/16/2012	**0.039**	9.68	5.9	8.1	73	201.3	60.3

Data Source: AFCEC, February 2013, MMR-AFCEC Data Warehouse

Notes:

1. MMCL from Massachusetts Department of Environmental Protection (MassDEP) web page, http://www.mass.gov/dep/water/dwstand.pdf.

Bold values represent EDB concentrations above the MMCL.

--: Sample collected through use of passive diffusion bag sampler; water quality parameter collection not performed.

*: Water quality parameters collected semiannually from 69EW0001 and 69EW0002.

Key:

BRL = below reporting limit
°C = degrees Celsius
DO = dissolved oxygen
EDB = ethylene dibromide
FS-28 = Fuel Spill-28
J = estimated concentration
mg/L = milligrams per liter
MMCL = Massachusetts Maximum Contaminant Level
mV = millivolts
ND = not detected
NTU = nephelometric turbidity units
ORP = oxidation-reduction potential
SpC = specific conductance
std = standard units
Temp = temperature
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter

Table 3
FS-28 Surface Water Monitoring Results
FS-28 2012 Summary Letter Report

Location	Date	Laboratory Analyses	Water Quality Parameters					
		EDB[1,2] (µg/L)	Temp (°C)	pH (std)	DO (mg/L)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69SW0006	6/11/2012	ND	16.95	6.34	7.94	71	218.4	0.3
69SW0006	8/20/2012	ND	16.45	6.4	6.85	95	214.4	1.8
69SW0010	6/11/2012	ND	16.97	6.41	8.88	72	195.4	0.5
69SW0010	8/20/2012	ND	16.26	6.49	7.93	94	175	0.6
69SW0019	6/11/2012	ND	17.39	6.28	8.3	74	157	1
69SW0019	8/20/2012	ND	16.53	6.43	7.52	97	157.7	1.2
69SW0046	6/11/2012	ND	17.28	6.15	9.74	75	157.1	1.3
69SW0046	8/20/2012	ND	16.02	6.33	7.33	98	159.6	7.7
69SW0048	6/11/2012	ND	15.87	6.3	9.42	76	157.7	3
69SW0048	8/20/2012	ND	15.77	6.53	8.45	91	179.5	1.2
69SW0049	6/11/2012	ND	14.42	6.75	9.89	79	149.3	0.9
69SW0049	8/20/2012	ND	15.11	6.7	8.13	102	148.4	2.4
69SW0060	6/11/2012	ND	18.33	6	10.76	105	195	1.1
69SW0060	8/20/2012	ND	18.66	6.08	8.66	136	168.8	21
69SW0527	6/11/2012	ND	21.29	8.39	11.11	81	140.7	0.5
69SW0527	8/20/2012	ND	21.8	6.76	7.28	105	121.3	2.6
69SW2001	6/11/2012	ND	17.25	5.71	8.54	96	181.4	5.8
69SW2001	8/20/2012	ND	17.3	5.76	5.78	71	217.2	2.5
69SW2002	6/11/2012	ND	20.09	6.03	6.66	40	269.8	12.3
69SW2002	8/20/2012	ND	20.2	6.1	2.89	77	133.3	18.6
69SW2007	6/11/2012	ND	14.79	5.97	12.35	118	230	0.5
69SW2007	8/20/2012	ND	15.71	6.13	8.18	119	198.6	2

Data Source: AFCEC, February 2013, MMR-AFCEC Data Warehouse

Notes:

1. EDB screening-level risk based concentration for imminent human health risk (10^{-3} risk) = 7.71 µg/L: Preliminary Screening-Level Human Health Risk Evaluation for Exposure to FS-28 Surface Water; Appendix D of *Final Fuel Spill-28 2002 Annual System Performance and Ecological Impact Monitoring Report* , dated March 2003.
2. EDB screening-level ecological benchmark = 31 µg/L: *Final Ethylene Dibromide Derivation of Aquatic Screening Benchmarks* , dated November 1998.

Key:

°C = degrees Celsius
DO = dissolved oxygen
EDB = ethylene dibromide
FS-28 = Fuel Spill-28
mg/L = milligrams per liter
mV = millivolts
ND = not detected
NTU = nephelometric turbidity units
ORP = oxidation-reduction potential
SpC = specific conductance
std = standard units
Temp = temperature
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter

Table 4
FS-28 Meeting Presentations
FS-28 2012 Summary Letter Report

Technical Update Meetings

20 June 2012	FS-28 2012 Triennial SPEIM Data Presentation
27 September 2012	FS-28 2012 Triennial SPEIM Data Presentation Follow Up

MMR Cleanup Team (MMRCT)

No presentations

SMB Meetings

No presentations

Conferences

No presentations

Table 5
FS-28 Treatment Plant Sampling Results
FS-28 2012 Summary Letter Report

Month of Event	Sample Date	Loc ID	Sample Location	Laboratory Analyses	Water Quality Parameters					
				EDB (µg/L) MMCL = 0.02	Temp (°C)	pH (std)	DO (mg/L)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
Carbon was exchanged in CF101A on 18 January 2012. Following replacement, CF101B was aligned as lead and CF101A as lag. Coconut based carbon was installed at FS-28 as part of an optimization evaluation.										
February	30-Jan-12	69EW0001	69EW0001 Influent	**0.075**	--	--	--	--	--	--
		69EW0002	69EW0002 Influent	0.019	--	--	--	--	--	--
		69PLT01003	Intermediate (101B)	ND	--	--	--	--	--	--
		69PLT01010	Effluent	ND	--	--	--	--	--	--
March	27-Feb-12	69EW0001	69EW0001 Influent	**0.079**	--	--	--	--	--	--
		69EW0002	69EW0002 Influent	0.020	--	--	--	--	--	--
		69PLT01003	Intermediate (101B)	ND	--	--	--	--	--	--
		69PLT01010	Effluent	ND	--	--	--	--	--	--
April	27-Mar-12	69EW0001	69EW0001 Influent	**0.100**	--	--	--	--	--	--
		69EW0002	69EW0002 Influent	**0.021**	--	--	--	--	--	--
		69PLT01003	Intermediate (101B)	ND	--	--	--	--	--	--
		69PLT01010	Effluent	ND	--	--	--	--	--	--
May	26-Apr-12	69EW0001	69EW0001 Influent	**0.075**	--	--	--	--	--	--
		69EW0002	69EW0002 Influent	0.016	--	--	--	--	--	--
		69PLT01003	Intermediate (101B)	ND	--	--	--	--	--	--
		69PLT01010	Effluent	ND	--	--	--	--	--	--
June	29-May-12	69EW0001	69EW0001 Influent	**0.065**	11.23	5.89	4.18	75	170.8	0.0
		69EW0002	69EW0002 Influent	0.018	12.09	6.58	2.88	74	137.7	0.0
		69PLT01003	Intermediate (101B)	ND	11.35	5.94	6.35	75	185.3	0.0
		69PLT01010	Effluent	ND	11.42	5.99	7.97	75	186.5	1.0
July	26-Jun-12	69EW0001	69EW0001 Influent	**0.068**	--	--	--	--	--	--
		69EW0002	69EW0002 Influent	0.015	--	--	--	--	--	--
		69PLT01003	Intermediate (101B)	ND	--	--	--	--	--	--
		69PLT01010	Effluent	ND	--	--	--	--	--	--
August	18-Jul-12	69EW0001	69EW0001 Influent	**0.065**	--	--	--	--	--	--
		69EW0002	69EW0002 Influent	0.017	--	--	--	--	--	--
		69PLT01003	Intermediate (101B)	ND	--	--	--	--	--	--
		69PLT01010	Effluent	ND	--	--	--	--	--	--

Table 5
FS-28 Treatment Plant Sampling Results
FS-28 2012 Summary Letter Report

Month of Event	Sample Date	Loc ID	Sample Location	Laboratory Analyses	Water Quality Parameters					
				EDB (µg/L) MMCL = 0.02	Temp (°C)	pH (std)	DO (mg/L)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
September	28-Aug-12	69EW0001	69EW0001 Influent	**0.058**	--	--	--	--	--	--
		69EW0002	69EW0002 Influent	0.015	--	--	--	--	--	--
		69PLT01003	Intermediate (101B)	BRL	--	--	--	--	--	--
		69PLT01010	Effluent	ND	--	--	--	--	--	--
October	27-Sep-12	69EW0001	69EW0001 Influent	**0.057**	--	--	--	--	--	--
		69EW0002	69EW0002 Influent	0.014	--	--	--	--	--	--
		69PLT01003	Intermediate (101B)	BRL	--	--	--	--	--	--
		69PLT01010	Effluent	ND	--	--	--	--	--	--
November	25-Oct-12	69EW0001	69EW0001 Influent	**0.044**	--	--	--	--	--	--
		69EW0002	69EW0002 Influent	0.014	--	--	--	--	--	--
		69PLT01003	Intermediate (101B)	BRL	--	--	--	--	--	--
		69PLT01010	Effluent	ND	--	--	--	--	--	--
December	28-Nov-12	69EW0001	69EW0001 Influent	**0.045**	11.38	6.65	4.3	71	185.5	0.0
		69EW0002	69EW0002 Influent	0.012	10.50	6.83	1.71	72	150.9	0.0
		69PLT01003	Intermediate (101B)	BRL	11.31	6.64	4.66	71	224.3	0.0
		69PLT01010	Effluent	ND	11.32	6.61	6.60	70	217.8	3.9
January	26-Dec-12	69EW0001	69EW0001 Influent	**0.039**	--	--	--	--	--	--
		69EW0002	69EW0002 Influent	0.012	--	--	--	--	--	--
		69PLT01003	Intermediate (101A)	BRL	--	--	--	--	--	--
		69PLT01010	Effluent	ND	--	--	--	--	--	--

Data Source: AFCEC, February 2013, MMR-AFCEC Data Warehouse

Notes:

Bold values represent EDB concentrations above the MMCL.

Water quality parameters (pH, temperature, DO, SpC, turbidity, and ORP) were measured semiannually at influent, post-GAC at each active GAC vessel, and plant effluent sampling locations. The measurements are taken using a flow-through cell and the Yellow Springs Instrument (YSI).

-- = water quality parameters not collected.

Key:

BRL = below reporting limit
^{o}C = degrees Celsius
DO = dissolved oxygen
EDB = ethylene dibromide
FS-28 = Fuel Spill-28
GAC = granular activated carbon
mg/L = milligrams per liter
MMCL = Massachusetts Maximum Contaminant Level
mV = millivolts
ND = not detected
NTU = nephelometric turbidity units
ORP = oxidation-reduction potential
SpC = specific conductance
Temp = temperature
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter

Table 6
FS-28 Treatment System Flow Rates
FS-28 2012 Summary Letter Report

Week Ending	69EW0001 Flow Rate (gpm)	69EW0002 Flow Rate (gpm)	Treatment Plant Total Flow Rate (gpm)
2010 Scenario 01			
7-Jan-12	531	75	606
14-Jan-12	522	75	597
21-Jan-12	448	63	512
28-Jan-12	526	75	601
4-Feb-12	524	75	599
11-Feb-12	521	75	596
18-Feb-12	518	72	590
25-Feb-12	501	73	574
3-Mar-12	178	75	253
10-Mar-12	0	75	75
17-Mar-12	194	75	268
24-Mar-12	540	63	602
31-Mar-12	519	65	584
7-Apr-12	550	75	625
14-Apr-12	551	75	626
21-Apr-12	550	62	612
28-Apr-12	470	64	534
5-May-12	453	62	514
12-May-12	550	75	625
19-May-12	546	75	621
26-May-12	547	75	622
2-Jun-12	550	75	625
9-Jun-12	549	75	624
16-Jun-12	546	75	621
23-Jun-12	545	75	621
30-Jun-12	548	75	623
7-Jul-12	550	73	624
14-Jul-12	501	67	568
21-Jul-12	551	74	625
28-Jul-12	549	73	622
4-Aug-12	547	76	623
11-Aug-12	545	71	617
18-Aug-12	549	70	619
Average Flow Rate (gpm)	**493**	**72**	**565**
Optimized Design Flow Rate (gpm) (2010 Scenario 01)	**550**	**75**	**625**
Percent of Optimized Design Rate	**90**	**96**	**90**
2012 Scenario 01			
25-Aug-12	549	58	606
1-Sep-12	549	43	592
8-Sep-12	549	35	583
15-Sep-12	545	51	596
22-Sep-12	553	49	601
29-Sep-12	548	51	600
6-Oct-12	547	51	598
13-Oct-12	527	51	578
20-Oct-12	542	51	594
27-Oct-12	550	50	600
3-Nov-12	359	37	395
10-Nov-12	523	51	573
17-Nov-12	548	48	596
24-Nov-12	545	51	596
1-Dec-12	546	51	597
8-Dec-12	548	51	599
15-Dec-12	546	51	597
22-Dec-12	550	51	601
29-Dec-12	549	51	600
Average Flow Rate (gpm)	**535**	**49**	**584**
Optimized Design Flow Rate (gpm) (2012 Scenario 01)	**550**	**50**	**600**
Percent of Optimized Design Rate	**97**	**98**	**97**

Data Source: AFCEC, January 2013, MMR-AFCEC Data Warehouse.

Notes:

1. Flow rates presented are weekly averages.
2. Downtimes due to routine and non-routine operations and maintenance activities were included in the calculation of the average flow rates.
3. 2010 Scenario 01 started on 07 October 2010 with an increase in flow at 69EW0002 from 50 to 75 gpm until 22 August 2012 when the flow was returned to 50 gpm (2012 Scenario 01); 69EW0001 flow remained at 550 gpm under 2012 Scenario 01.

Key:

gpm = gallons per minute

N/A = not applicable

Table 7
FS-28 Treatment System Downtime Summary
FS-28 2012 Summary Letter Report

Date	Hours Off-Line	Reason
2/22/2012	4.58	69EW0002 off power failure.
2/28/2012	386.00	69EW0001 off for well maintenance.
3/18/2012	10.33	Plant tripped off due to a power failure.
3/19/2012	7.50	69EW0002 off due to a power failure.
3/28/2012	22.00	Plant tripped off due to a power failure.
4/28/2012	54.00	Plant tripped off due to a power failure.
7/12/2012	15.58	Energy curtailment.
7/24/2012	8.25	69EW0002 off due to a power failure/VFD fault.
8/12/2012	6.66	69EW0002 off due to a power failure.
9/1/2012	64.50	69EW0002 off due to a power failure.
9/18/2012	7.75	69EW0002 off due to a power failure.
10/29/2012	67.83	Intentionally shut plant down due to hurricane/possible energy curtailment.
11/7/2012	3.50	Plant tripped off due to a power failure.
11/8/2012	4.95	Plant tripped off due to a power failure.
11/11/2012	11.08	69EW0002 off due to a power failure.
12/30/2012	10.80	Plant tripped off due to a power failure.
12/31/2012	3.83	69EW0001 off due to a VFD fault.

Key:
VFD = variable frequency drive

Table 8
FS-28 Treatment System Mass Removal Summary
FS-28 2012 Summary Letter Report

Date	69EW0001 (Extraction Well Influent)		69EW0002 (Extraction Well Influent)		69PLT01023 (SWP Influent)		Total EDB Removed	
	Incremental Mass Removed (lbs)	Cumulative Mass Removed (lbs)	Incremental Mass Removed (lbs)	Cumulative Mass Removed (lbs)	Incremental Mass Removed (lbs)	Cumulative Mass Removed (lbs)	Incremental Mass Removed (lbs)	Cumulative Mass Removed (lbs)
Jan-12	0.014	12.580	0.0005	0.045	0.000	2.068	0.015	14.693
Feb-12	0.013	12.600	0.0005	0.045	0.000	2.068	0.014	14.713
Mar-12	0.011	12.610	0.0005	0.046	0.000	2.068	0.011	14.724
Apr-12	0.014	12.620	0.0004	0.046	0.000	2.068	0.014	14.734
May-12	0.013	12.640	0.0005	0.047	0.000	2.068	0.014	14.755
Jun-12	0.013	12.650	0.0004	0.047	0.000	2.068	0.014	14.765
Jul-12	0.013	12.660	0.0005	0.048	0.000	2.068	0.013	14.776
Aug-12	0.012	12.670	0.0004	0.048	0.000	2.068	0.012	14.786
Sep-12	0.011	12.690	0.0002	0.048	0.000	2.068	0.011	14.806
Oct-12	0.008	12.690	0.0002	0.049	0.000	2.068	0.008	14.807
Nov-12	0.009	12.700	0.0002	0.049	0.000	2.068	0.009	14.817
Dec-12	0.008	12.710	0.0002	0.049	0.000	2.068	0.008	14.827
EDB removed (lbs) by extraction well 69EW0001 during reporting period (January 2012 - December 2012)								**0.139**
EDB removed (lbs) by extraction well 69EW0002 during reporting period (January 2012 - December 2012)								**0.005**
Total EDB removed (lbs) during reporting period (January 2012 - December 2012)								**0.144**
Total EDB removed (lbs) since system startup (October 1997 - December 2012)								**14.827**

Data Source: AFCEC, February 2013, MMR-AFCEC Data Warehouse

Notes:
69EW0001 started operating in October 1997.
SWPs started operating in April 1999 and ceased operation in November 2008.
69EW0002 started operating in December 2007.

Key:
EDB = ethylene dibromide
FS-28 = Fuel Spill-28
lbs = pounds
SWP = shallow wellpoint

Table 9
FS-28 Remedial System Electrical Consumption and Associated Air Emissions
FS-28 2012 Summary Letter Report

		1/1/2012 to 12/31/2012	System Startup (11/1997) to 12/31/2012
Volume of Groundwater Treated (million gallons)		**300**	**5,219**
Groundwater COC Mass Removal (pounds)		**0.144**	**14.827**
Electrical Usage (MWh)		**377**	**7,609**
Estimated Air Emissions[1] (based on electrical usage)	**CO_2 (tons)**	247	6,123
	NOx (lbs)	532	9,805
	PM-10 (lbs)	30	381
	SO_2 (lbs)	1,418	12,454
	VOCs (lbs)	19	451
Estimated Reduction in Air Emissions due to Green Power Purchases[2]	**CO_2 (tons)**	71	584
	NOx (lbs)	154	1,154
	PM-10 (lbs)	9	60
	SO_2 (lbs)	410	2,636
	VOCs (lbs)	5	43
Estimated Reduction in Air Emissions due to MMR Wind Turbine Operation[3]	**CO_2 (tons)**	254	425
	NOx (lbs)	548	916
	PM-10 (lbs)	31.3	52.4
	SO_2 (lbs)	1,460	2443
	VOCs (lbs)	19	32
Estimated Total Air Emissions with consideration of Green Power Purchases and MMR Wind Turbine Operation	**CO_2 (tons)**	**0**	**5,192**
	NOx (lbs)	**0**	**7,905**
	PM-10 (lbs)	**0**	**279**
	SO_2 (lbs)	**0**	**7,828**
	VOCs (lbs)	**0**	**381**

Notes:

1) The estimated air emissions presented in this table are based on the assumption that until 4/30/2009, the power used to operate the MMR remedial systems was provided by the Mirant Canal Station power plant in Sandwich, MA. This power plant primarily produced electricity generated by the combustion of fuel oil and has been off-line since 5/1/2009. Starting on 5/1/2009, air emissions are based on electricity generated by the average mix of power sources in Massachusetts. Air emissions were calculated using MMR utility data from AFCEC's Metrix 4 Utility Accounting Software
(http://www.abraxasenergy.com/metrix4.php) and emission factors obtained from the following websites:
http://www.csgnetwork.com/elecpowerpolcalc.html
http://www.metrixcentral.com/EmissionsCalculator/Emissions%20Factors%202004.pdf
2) Emissions offset by purchases of electricity from renewable sources beginning 7/1/2008 and ending on 8/1/2012.
3) Emissions offset by operation of AFCEC-owned wind turbines beginning on 12/2/2009 (Wind I) and 11/8/2011 (Wind II).

Key:
COC = contaminant of concern
CO_2 = carbon dioxide
FS-28 = Fuel Spill-28
lbs = pounds
MMR = Massachusetts Military Reservation
MWh = megawatt hours
NO_x = nitrogen oxides
PM-10 = particulate matter with a diameter of 10 micrometers or less
SO_2 = sulfur dioxide
VOCs = volatile organic compounds

ATTACHMENT A

Comparison of Detected Concentrations in FS-28 Groundwater and Treatment Plant Samples to Applicable Groundwater Standards

Attachment A
Comparison of Detected Concentrations in FS-28 Groundwater and Treatment Plant Samples to Applicable Groundwater Standards
FS-28 2012 Summary Letter Report

Location Identification	Sample Date	Sample Elevation (ft msl)	Matrix	Test	Analyte	Result	DL	RL	Standard	Type [1]	Standard Exceeded?
						All units = µg/L					
69EW0001	1/30/2012	-159.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.075	0.005	0.01	0.02	MMCL	Yes
69EW0001	2/27/2012	-159.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.079	0.005	0.01	0.02	MMCL	Yes
69EW0001	3/27/2012	-159.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.100	0.005	0.01	0.02	MMCL	Yes
69EW0001	4/26/2012	-159.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.075	0.005	0.01	0.02	MMCL	Yes
69EW0001	5/29/2012	-159.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.065	0.005	0.01	0.02	MMCL	Yes
69EW0001	6/26/2012	-159.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.068	0.005	0.01	0.02	MMCL	Yes
69EW0001	7/18/2012	-159.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.065	0.005	0.01	0.02	MMCL	Yes
69EW0001	8/28/2012	-159.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.058	0.005	0.01	0.02	MMCL	Yes
69EW0001	9/27/2012	-159.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.057	0.005	0.01	0.02	MMCL	Yes
69EW0001	10/25/2012	-159.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.044	0.005	0.01	0.02	MMCL	Yes
69EW0001	11/28/2012	-159.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.045	0.005	0.01	0.02	MMCL	Yes
69EW0001	12/26/2012	-159.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.039	0.005	0.01	0.02	MMCL	Yes
69EW0002	1/30/2012	-152.1	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.019	0.005	0.01	0.02	MMCL	No
69EW0002	2/27/2012	-152.1	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.02	0.005	0.01	0.02	MMCL	No
69EW0002	3/27/2012	-152.1	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.021	0.005	0.01	0.02	MMCL	Yes
69EW0002	4/26/2012	-152.1	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.016	0.005	0.01	0.02	MMCL	No
69EW0002	5/29/2012	-152.1	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.018	0.005	0.01	0.02	MMCL	No
69EW0002	6/26/2012	-152.1	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.015	0.005	0.01	0.02	MMCL	No
69EW0002	7/18/2012	-152.1	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.017	0.005	0.01	0.02	MMCL	No
69EW0002	8/28/2012	-152.1	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.015	0.005	0.01	0.02	MMCL	No
69EW0002	9/27/2012	-152.1	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.014	0.005	0.01	0.02	MMCL	No
69EW0002	10/25/2012	-152.1	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.014	0.005	0.01	0.02	MMCL	No
69EW0002	11/28/2012	-152.1	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.012	0.005	0.01	0.02	MMCL	No
69EW0002	12/26/2012	-152.1	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.012	0.005	0.01	0.02	MMCL	No
69MW0033A	2/7/2012	5.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	0.02	MMCL	No
69MW0034A	2/16/2012	-114.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.017	0.005	0.01	0.02	MMCL	No
69MW1283A	2/2/2012	-136.0	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.425	0.025	0.05	0.02	MMCL	Yes
69MW1283B	2/2/2012	-186.1	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.933	0.025	0.05	0.02	MMCL	Yes
69MW1284A	2/2/2012	-180.0	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.267	0.01	0.02	0.02	MMCL	Yes
69MW1284B	2/29/2012	-215.9	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.786	0.024	0.05	0.02	MMCL	Yes
69MW1300A	2/1/2012	-1.3	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	0.02	MMCL	No
69MW1304	2/2/2012	-181.0	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.859	0.047	0.09	0.02	MMCL	Yes
69MW1306A	2/9/2012	-81.7	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	0.02	MMCL	No
69MW1310	2/2/2012	-202.2	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.032 J	0.005	0.01	0.02	MMCL	Yes
69MW1314	2/9/2012	-207.1	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.046	0.005	0.01	0.02	MMCL	Yes
69PLT01003 (MID)	8/28/2012	N/A	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	0.02	MMCL	No
69PLT01003 (MID)	9/27/2012	N/A	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	0.02	MMCL	No
69PLT01003 (MID)	10/25/2012	N/A	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	0.02	MMCL	No
69PLT01003 (MID)	11/28/2012	N/A	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	0.02	MMCL	No
69PLT01003 (MID)	12/26/2012	N/A	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	0.02	MMCL	No
69PZ1403	2/16/2012	-95.4	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.039	0.005	0.01	0.02	MMCL	Yes

Data Source: AFCEC, February 2013, MMR-AFCEC Data Warehouse

Notes:

1. MMCL from Massachusetts Department of Environmental Protection (MassDEP) web page, http://www.mass.gov/dep/water/dwstand.pdf.

Key:

BRL = below reporting limit
DL = detection limit
EDB = ethylene dibromide
FS-28 = Fuel Spill-28
ft = feet
J = estimated concentration
MID = treatment plant midpoint sample
msl = mean sea level
MMCL = Massachusetts Maximum Contaminant Level
N/A = information not applicable
RL = reporting limit
WG = groundwater sample
WW = plant water
µg/L = micrograms per liter

ATTACHMENT B

FS-28 2012 SLR
Data Summary Report

Attachment B
Data Summary Report
Fuel Spill-28 2012 Summary Letter Report

INTRODUCTION

The objective of this data summary report (DSR) is to assess the data quality of analytical results for samples collected for the Fuel Spill-28 System Performance and Ecological Impact Monitoring (SPEIM) Program at the Massachusetts Military Reservation (MMR) as presented in the *Fuel Spill-28 2012 Summary Letter Report*. This report is intended as a general data quality assessment designed to summarize data issues.

ANALYTICAL DATA

This DSR covers 89 groundwater samples with two field duplicate samples, 22 surface water samples with two field duplicate samples, and 24 wastewater samples. Two field quality control (QC) samples were taken. Field duplicates are not required for treatment plant samples. These samples were reported under 25 sample delivery groups. Samples were collected between 30 January 2012 and 26 December 2012. The analyses were performed by Analytics Environmental Laboratory LLC (ANAP) in Portsmouth, New Hampshire. Samples were collected and shipped by overnight carrier or delivered by courier to ANAP. Samples were analyzed for the analyte/method provided in Table B-1.

Table B-1
Analytical Parameter

Parameter	Method	Laboratory
Ethylene Dibromide (EDB)	E504.1	ANAP

E = Environmental Protection Agency (EPA) Method

The data were assessed using the MMR SPEIM Quality Assurance Project Plan (QAPP)[1]. The assessment included a review of the following:

- Chain-of-Custody documentation

[1] AFCEE. 2012 (July). *AFCEE MMR SPEIM/LTM/O&M Program Quality Assurance Project Plan.* 420005-Program-Multiple-QAPP-001. Prepared by CH2M HILL for AFCEE/MMR, Installation Restoration Program, Otis ANG Base, MA.

- Holding time compliance
- Required QC samples at the specified frequencies
- Method blanks
- Laboratory control spiking samples
- Surrogate spike recoveries
- Initial and continuing calibration information and other method-specific criteria as defined by the SPEIM QAPP

Field samples were reviewed to ascertain field compliance and data quality issues. This included a review of trip blanks, equipment blanks, and field duplicates.

Data were carried through data validation as described in the SPEIM QAPP and data flags were assigned according to the SPEIM QAPP. These flags, and the reason for each flag, were entered into the electronic database and can be found in Table B-2. Multiple flags are routinely applied to specific sample method/matrix/analyte combinations, but there is only one final flag. A final flag is applied to the data, and is the most conservative of the applied validation flags. The final flag also includes matrix and blank sample impacts.

The data flags are listed in the SPEIM QAPP and are defined as follows:

- J = Analyte was present but the reported value may not be accurate or precise (estimated).
- R = Analyte result was unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.
- U = Analyte was not detected at the specified detection limit.
- UJ = Analyte was not detected and the specified detection limit may not be accurate or precise (estimated).

FINDINGS

The summaries of the data validation findings are contained in the following subsections and Table B-2.

Holding Times

All holding-time criteria were met. No holding time flags were applied.

Calibration

Initial and continuing calibrations were analyzed as required in every analytical batch and were in control. No calibration flags were applied.

Method Blanks

Method blanks were analyzed at the required frequency for each method. No method blank flags were applied.

Field Blanks

Equipment blanks were collected and analyzed at the required frequency. No field blank flags were applied.

Field Duplicates

Field duplicates were collected as required, and precision was acceptable. No field duplicate flags were applied.

Matrix Spike Samples

Matrix spike/matrix spike duplicates were not required for these samples in accordance with the SPEIM QAPP.

Surrogates

Surrogate recoveries met each method SPEIM QAPP criteria overall. There were 11 samples with surrogate recovery less than lower limit for method E504.1. One detected and 10 non-detected results were qualified as estimated values and flagged "J" and "UJ".

Laboratory Control Samples

Laboratory control sample/laboratory control sample duplicates (LCS/LCSD) were analyzed as required and in control. No LCS flags were applied.

Confirmation Results

Confirmation samples were analyzed as required by method E504.1. No confirmation flags were applied.

Chain of Custody

No chain of custody anomalies were noted in the review.

Overall Assessment

The goal of this assessment is to demonstrate that a sufficient number of representative samples were collected and the resulting analytical data can be used to support the decision-making process. The procedures for assessing the precision, accuracy, representativeness, completeness, and comparability parameters (PARCC) are addressed in the SPEIM QAPP. The following summary highlights the PARCC findings for the above-defined events:

1 The completeness goal for valid usable data is 95 percent for aqueous samples. Completeness for aqueous samples was 100 percent. The completeness goal was met for all compounds. The routinely acceptable performance of field and laboratory QC indicators (field duplicates, field blanks, laboratory blanks, surrogate spikes, LCS, and calibrations) shows that the precision and accuracy of the data met project objectives.

2 Sample results are representative and comparable to field conditions and past historical data because the field sampling and laboratory analyses were performed using standardized and documented procedures as defined in project documents. In addition, all results were reported with industry standard units.

Table B-2
Validation Flags[a]

Field ID	Method	Analyte	Final Result (µg/L)	Final Flag	Reason
CHPK0017A-T0212DIF	E504.1	1,2-Dibromoethane (EDB)	0.005	UJ	Sur<LCL
CHPK01302-T0212DIF	E504.1	1,2-Dibromoethane (EDB)	0.005	UJ	Sur<LCL
CHPK01310-T0212DIF	E504.1	1,2-Dibromoethane (EDB)	0.032	J	Sur<LCL
CHPK0317C-T0212DIF	E504.1	1,2-Dibromoethane (EDB)	0.005	UJ	Sur<LCL
CHPL00046-S0812	E504.1	1,2-Dibromoethane (EDB)	0.005	UJ	Sur<LCL
CHPL00048-S0812	E504.1	1,2-Dibromoethane (EDB)	0.005	UJ	Sur<LCL
CHPL00049-S0812	E504.1	1,2-Dibromoethane (EDB)	0.005	UJ	Sur<LCL
CHPL00060-S0812	E504.1	1,2-Dibromoethane (EDB)	0.005	UJ	Sur<LCL
CHPL00527-S0812	E504.1	1,2-Dibromoethane (EDB)	0.005	UJ	Sur<LCL
CHPL02002-S0812	E504.1	1,2-Dibromoethane (EDB)	0.005	UJ	Sur<LCL
CHPL10527-S0812	E504.1	1,2-Dibromoethane (EDB)	0.005	UJ	Sur<LCL

[a]Field samples and field duplicates only.
Table sorted by Reason, Analyte and Field ID.

Key:
J = estimated
Sur<LCL = Surrogate recovery less than lower limit
UJ = estimated non-detection
µg/L = micrograms per liter

Attachment B
Analytical Laboratory Results, January - December 2012
Fuel Spill-28 2012 Summary Letter Report

Location	Date	Sample ID	Depth	Type	Matrix	Test	Prep	Analyte	Result	DL	RL	Units	Qual
69EW0001	1/30/2012	CHTC00001-M0212	190.04	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.075	0.005	0.01	µg/L	
69EW0001	2/27/2012	CHTC00001-M0312	190.04	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.079	0.005	0.01	µg/L	
69EW0001	3/27/2012	CHTC00001-M0412	190.04	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.1	0.005	0.01	µg/L	
69EW0001	4/26/2012	CHTC00001-M0512	190.04	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.075	0.005	0.01	µg/L	
69EW0001	5/29/2012	CHTC00001-M0612	190.04	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.065	0.005	0.009	µg/L	
69EW0001	6/26/2012	CHTC00001-M0712	190.04	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.068	0.005	0.01	µg/L	
69EW0001	7/18/2012	CHTC00001-M0812	190.04	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.065	0.005	0.01	µg/L	
69EW0001	8/28/2012	CHTC00001-M0912	190.04	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.058	0.005	0.01	µg/L	
69EW0001	9/27/2012	CHTC00001-M1012	190.04	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.057	0.005	0.01	µg/L	
69EW0001	10/25/2012	CHTC00001-M1112	190.04	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.044	0.005	0.01	µg/L	
69EW0001	11/28/2012	CHTC00001-M1212	190.04	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.045	0.005	0.01	µg/L	
69EW0001	12/26/2012	CHTC00001-M0113	190.04	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.039	0.005	0.01	µg/L	
69EW0002	1/30/2012	CHTC00002-M0212	192.00	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.019	0.005	0.01	µg/L	
69EW0002	2/27/2012	CHTC00002-M0312	192.00	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.02	0.005	0.01	µg/L	
69EW0002	3/27/2012	CHTC00002-M0412	192.00	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.021	0.005	0.01	µg/L	
69EW0002	4/26/2012	CHTC00002-M0512	192.00	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.016	0.005	0.009	µg/L	
69EW0002	5/29/2012	CHTC00002-M0612	192.00	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.018	0.005	0.01	µg/L	
69EW0002	6/26/2012	CHTC00002-M0712	192.00	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.015	0.005	0.01	µg/L	
69EW0002	7/18/2012	CHTC00002-M0812	192.00	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.017	0.005	0.01	µg/L	
69EW0002	8/28/2012	CHTC00002-M0912	192.00	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.015	0.005	0.01	µg/L	
69EW0002	9/27/2012	CHTC00002-M1012	192.00	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.014	0.005	0.01	µg/L	
69EW0002	10/25/2012	CHTC00002-M1112	192.00	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.014	0.005	0.01	µg/L	
69EW0002	11/28/2012	CHTC00002-M1212	192.00	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.012	0.005	0.009	µg/L	
69EW0002	12/26/2012	CHTC00002-M0113	192.00	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.012	0.005	0.01	µg/L	
69MW0028A	2/15/2012	CHPK0028A-T0212DIF	97.30	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW0029A	2/15/2012	CHPK0029A-T0212DIF	168.02	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW0029B	2/15/2012	CHPK0029B-T0212DIF	131.80	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	U
69MW0030A	2/15/2012	CHPK0030A-T0212DIF	127.82	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW0031A	2/15/2012	CHPK0031A-T0212DIF	157.30	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW0032A	2/15/2012	CHPK0032A-T0212DIF	175.30	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	U
69MW0032B	2/15/2012	CHPK0032B-T0212DIF	142.38	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW0033A	2/7/2012	CHPK0033A-T0212DIF	22.30	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	µg/L	J
69MW0034A	2/16/2012	CHPK0034A-T0212DIF	143.19	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.017	0.005	0.01	µg/L	
69MW1272	2/14/2012	CHPK01272-T0212DIF	100.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1275	2/16/2012	CHPK01275-T0212DIF	123.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1278	2/2/2012	CHPK01278-T0212DIF	149.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1279C	10/4/2012	CHPL01279C-A1012DIF	152.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1283A	2/2/2012	CHPK1283A-T0212DIF	172.50	FD1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.443	0.025	0.049	µg/L	
69MW1283A	2/2/2012	CHPK0283A-T0212DIF	172.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.425	0.025	0.05	µg/L	
69MW1283B	2/2/2012	CHPK0283B-T0212DIF	222.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.933	0.025	0.049	µg/L	
69MW1284A	2/2/2012	CHPK0284A-T0212DIF	211.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.267	0.01	0.02	µg/L	
69MW1284B	2/29/2012	CHPK1284B-T0212DIF	247.50	FD1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.706	0.024	0.048	µg/L	
69MW1284B	2/29/2012	CHPK0284B-T0212DIF	247.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.786	0.024	0.048	µg/L	
69MW1285A	2/7/2012	CHPK0285A-T0212DIF	62.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1285B	2/7/2012	CHPK0285B-T0212DIF	182.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U

Attachment B
Analytical Laboratory Results, January - December 2012
Fuel Spill-28 2012 Summary Letter Report

Location	Date	Sample ID	Depth	Type	Matrix	Test	Prep	Analyte	Result	DL	RL	Units	Qual
69MW1286	2/9/2012	CHPK01286-T0212DIF	182.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1286A	2/1/2012	CHPK0286A-T0212DIF	129.77	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1290A	1/31/2012	CHPK0290A-T0212DIF	237.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1290B	1/31/2012	CHPK0290B-T0212DIF	291.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1291B	2/7/2012	CHPK0291B-T0212DIF	157.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1294	2/9/2012	CHPK01294-T0212DIF	42.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1296A	1/31/2012	CHPK0296A-T0212DIF	181.95	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1297	2/1/2012	CHPK01297-T0212DIF	147.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1300A	2/1/2012	CHPK0300A-T0212DIF	27.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	µg/L	J
69MW1300B	2/1/2012	CHPK0300B-T0212DIF	102.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1302	2/1/2012	CHPK01302-T0212DIF	102.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	UJ
69MW1303A	2/7/2012	CHPK0303A-T0212DIF	205.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1303B	2/7/2012	CHPK0303B-T0212DIF	246.35	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1304	2/2/2012	CHPK01304-T0212DIF	215.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.859	0.047	0.094	µg/L	
69MW1306A	2/9/2012	CHPK0306A-T0212DIF	107.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	µg/L	J
69MW1306C	2/9/2012	CHPK0306C-T0212DIF	143.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1310	2/2/2012	CHPK01310-T0212DIF	235.00	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.032	0.005	0.01	µg/L	J
69MW1311	1/31/2012	CHPK01311-T0212DIF	232.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1312	1/31/2012	CHPK01312-T0212DIF	197.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.011	µg/L	U
69MW1313	2/9/2012	CHPK01313-T0212DIF	217.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1314	2/9/2012	CHPK01314-T0212DIF	277.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.046	0.005	0.01	µg/L	
69MW1315	2/16/2012	CHPK01315-T0212DIF	235.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1316	1/31/2012	CHPK01316-T0212DIF	242.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1317A	2/7/2012	CHPK0317A-T0212DIF	172.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1317B	2/7/2012	CHPK0317B-T0212DIF	141.32	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1317C	2/7/2012	CHPK0317C-T0212DIF	90.25	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	UJ
69MW1318A	2/9/2012	CHPK0318A-T0212DIF	157.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1400A	2/14/2012	CHPK0400A-T0212DIF	152.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1401	2/14/2012	CHPK01401-T0212DIF	157.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1403	2/14/2012	CHPK01403-T0212DIF	217.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1404	2/16/2012	CHPK01404-T0212DIF	107.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1411	2/29/2012	CHPK01411-T0212DIF	222.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69MW1416	2/9/2012	CHPK01416-T0212DIF	122.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PLT01003	1/30/2012	CHTC01003-M0212	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PLT01003	2/27/2012	CHTC01003-M0312	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PLT01003	3/27/2012	CHTC01003-M0412	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PLT01003	4/26/2012	CHTC01003-M0512	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PLT01003	5/29/2012	CHTC01003-M0612	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	U
69PLT01003	6/26/2012	CHTC01003-M0712	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	U
69PLT01003	7/18/2012	CHTC01003-M0812	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PLT01003	8/28/2012	CHTC01003-M0912	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	µg/L	J
69PLT01003	9/27/2012	CHTC01003-M1012	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	µg/L	J
69PLT01003	10/25/2012	CHTC01003-M1112	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	µg/L	J
69PLT01003	11/28/2012	CHTC01003-M1212	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	µg/L	J
69PLT01003	12/26/2012	CHTC01003-M0113	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.005	0.01	µg/L	J

Attachment B
Analytical Laboratory Results, January - December 2012
Fuel Spill-28 2012 Summary Letter Report

Location	Date	Sample ID	Depth	Type	Matrix	Test	Prep	Analyte	Result	DL	RL	Units	Qual
69PLT01010	1/30/2012	CHTC01010-M0212	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PLT01010	2/27/2012	CHTC01010-M0312	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PLT01010	3/27/2012	CHTC01010-M0412	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PLT01010	4/26/2012	CHTC01010-M0512	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	U
69PLT01010	5/29/2012	CHTC01010-M0612	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PLT01010	6/26/2012	CHTC01010-M0712	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	U
69PLT01010	7/18/2012	CHTC01010-M0812	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PLT01010	8/28/2012	CHTC01010-M0912	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	U
69PLT01010	9/27/2012	CHTC01010-M1012	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PLT01010	10/25/2012	CHTC01010-M1112	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PLT01010	11/28/2012	CHTC01010-M1212	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PLT01010	12/26/2012	CHTC01010-M0113	N/A	N1	WW	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PZ0005B	2/15/2012	CHPK0005B-T0212DIF	42.40	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PZ0017A	2/13/2012	CHPK0017A-T0212DIF	179.70	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	UJ
69PZ0019B	2/13/2012	CHPK0019B-T0212DIF	40.47	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PZ0020A	2/13/2012	CHPK0020A-T0212DIF	178.85	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PZ0021A	2/13/2012	CHPK0021A-T0212DIF	159.27	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PZ0023A	2/29/2012	CHPK0023A-T0212DIF	172.64	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PZ1286B	2/1/2012	CHPK0286B-T0212DIF	97.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PZ1291A	2/29/2012	CHPK0291A-T0212	12.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PZ1298A	2/16/2012	CHPK0298A-T0212DIF	17.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PZ1300A	2/29/2012	CHPK0500A-T0212DIF	17.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PZ1302A	2/29/2012	CHPK0502A-T0212DIF	17.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PZ1308A	2/16/2012	CHPK0508A-T0212DIF	12.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69PZ1403	2/16/2012	CHPK01503-T0212	157.50	N1	WG	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.039	0.005	0.01	µg/L	
69SW0006	6/11/2012	CHPL00006-S0612	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69SW0006	8/20/2012	CHPL00006-S0812	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	U
69SW0010	6/11/2012	CHPL00010-S0612	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69SW0010	8/20/2012	CHPL00010-S0812	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69SW0019	6/11/2012	CHPL00019-S0612	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69SW0019	8/20/2012	CHPL00019-S0812	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69SW0046	6/11/2012	CHPL00046-S0612	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69SW0046	8/20/2012	CHPL00046-S0812	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	UJ
69SW0048	6/11/2012	CHPL00048-S0612	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	U
69SW0048	8/20/2012	CHPL00048-S0812	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	UJ
69SW0049	6/11/2012	CHPL00049-S0612	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	U
69SW0049	8/20/2012	CHPL00049-S0812	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	UJ
69SW0060	6/11/2012	CHPL00060-S0612	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69SW0060	8/20/2012	CHPL00060-S0812	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	UJ
69SW0527	6/11/2012	CHPL10527-S0612	N/A	FD1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69SW0527	6/11/2012	CHPL00527-S0612	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69SW0527	8/20/2012	CHPL10527-S0812	N/A	FD1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	UJ
69SW0527	8/20/2012	CHPL00527-S0812	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	UJ
69SW2001	6/11/2012	CHPL02001-S0612	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69SW2001	8/20/2012	CHPL02001-S0812	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	U

Attachment B
Analytical Laboratory Results, January - December 2012
Fuel Spill-28 2012 Summary Letter Report

Location	Date	Sample ID	Depth	Type	Matrix	Test	Prep	Analyte	Result	DL	RL	Units	Qual
69SW2002	6/11/2012	CHPL02002-S0612	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U
69SW2002	8/20/2012	CHPL02002-S0812	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	UJ
69SW2007	6/11/2012	CHPL02007-S0612	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.009	µg/L	U
69SW2007	8/20/2012	CHPL02007-S0812	N/A	N1	WS	E504.1	METHOD	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	ND	0.005	0.01	µg/L	U

Data Source: AFCEC, February 2013, MMR-AFCEC Data Warehouse

Key:

BRL = below reporting limit	RL = reporting limit
DL = detection limit	U = undetected
FD1 = field duplicate	UJ = estimated non-detection
J = estimated	WG = groundwater
N/A = not applicable	WS = surface water
ND = not detected	WW = wastewater
N1 = native sample	µg/L = micrograms per liter

ATTACHMENT C
FS-28 Project Note

Fuel Spill-28 2012 Triennial SPEIM Data Presentation
437075-SPEIM-FS28-PRJNOT-001

CH2MHILL	PROJECT NOTE	TASK ORDER 0337
		PROJECT NO. 437075
AFCEC **SPEIM/LTM Program** **Otis ANG Base, Massachusetts** **4P08 FA8903-08-D8769-337**	**DOCUMENT CONTROL NUMBER:** **437075-SPEIM-FS28-PRJNOT-001** **CDRL B010**	PAGE 1 OF 8

Confirmation Of:	Date Held: 20 June 2012
☒ Meeting	Location: Large IRP Conference Room
☐ Change Notice	Date Issued: 07 December 2012
☐ General Project Note	Recorded By: Nigel Tindall
Subject: **FUEL SPILL-28 2012 TRIENNIAL SPEIM DATA PRESENTATION** EPA #19 OU 09B SWOU-FS28/FS29 PLUMES	Issued By: Nigel Tindall N. Tindall CH2M HILL PROJECT MANAGER

ITEM	REMARKS
1.0	**INTRODUCTION** This project note summarizes the Fuel Spill-28 (FS-28) plume data presentation which included data collected for the FS-28 System Performance and Ecological Impact Monitoring (SPEIM) program. Data presented included the results of a triennial groundwater sampling event (January to February 2012), surface water sampling at the Coonamessett River (June and August 2011) and monthly treatment plant sampling (January through December 2011). These data were presented to the regulatory agencies during the 20 June 2012 Technical Update meeting. The handout for the presentation, including text slides and 10 figures, is included as Attachment A.
2.0	**BACKGROUND** The FS-28 plume is defined as the extent of groundwater containing the contaminant of concern (COC) ethylene dibromide (EDB) at concentrations exceeding the Massachusetts Maximum Contaminant Level (MMCL) of 0.02 micrograms per liter (µg/L). The FS-28 EDB plume is being remediated through the operation of the FS-28 extraction, treatment, and discharge (ETD) system. At the time of this data presentation (June 2012), the ETD system was operating under 2010 Scenario 01 conditions (AFCEE 2011) extracting groundwater using two extraction wells at a combined flow rate of 625 gallons per minute (gpm). The current distribution of flow to the treatment plant is as follows: (1) extraction well 69EW0001 operates at a flow rate of 550 gpm; and (2) extraction well 69EW0002 operates at a flow rate of 75 gpm; the locations of these two extraction wells are shown on Figure 1 in Attachment A. The third component of the FS-28 remedial system was a shallow wellpoint (SWP) system which was located to the south of 69EW0001. This SWP system was shutdown on a permanent basis in February 2010 because it was determined that although the SWP system had been successful in remediating the FS-28 plume in this area, it was no longer effective in remediating the remaining residual EDB contamination near the SWPs. Decommissioning activities associated with the SWP system were completed in February 2011 (AFCEE 2011). Monitoring the natural attenuation of the residual EDB contamination in this area is part of the ongoing SPEIM program at FS-28.

Distribution: AFCEC: Jon Davis, Rose Forbes, Admin. Record; EPA: Bob Lim;
MassDEP: Len Pinaud, Elliott Jacobs; CH2M HILL: Nigel Tindall, Doc. Control

ITEM	REMARKS
	Chemical and hydraulic data for the FS-28 plume have been collected through the SPEIM program since startup of the treatment system in 1997. This program was developed to monitor plume changes and to ensure the effective operation of the groundwater remediation systems; monitoring networks are also evaluated and optimized through the SPEIM program. The current approved FS-28 SPEIM monitoring network, including analytical scope and methods, is presented in the *Comprehensive Long Term Monitoring Plan* (CLTMP) available from the Air Force Civil Engineer Center (AFCEC). Note that all the analytical data collected in 2011 for the FS-28 SPEIM program were reported in the *Fuel Spill-28 2011 Summary Letter Report* (AFCEE 2012) and the data collected in 2012 will be included in the *Fuel Spill-28 2012 Summary Letter Report* scheduled for submittal in March 2013.
3.0	**RESULTS** Analytical results and concentration trend graphs were presented during the data presentation for select wells that are monitored throughout the FS-28 plume (Attachment A). Monitoring results were presented for: (i) the main EDB plume located upgradient (i.e., north) of 69EW0001; (ii) the area of residual EDB contamination near the SWP system; (iii) the deep leading edge lobe of the FS-28 EDB plume; and (iv) the former shallow leading edge lobe. Based on an evaluation of the monitoring data, the main findings are as follows: <u>Main EDB Plume</u> • Continued declining trend in EDB concentrations in the northern plume area and distant from 69EW0001 area due to attenuation and migration of the plume trailing edge; the only well with EDB concentrations above the MMCL sampled in this northern area is 69PZ1403 (Figure 1 in Attachment A). • Sporadic EDB detections at concentrations below the reporting limit (BRL) of 0.01 µg/L have been reported at 69MW1279C (Coonamessett Water Supply Well sentry well). • EDB concentrations at each of seven key indicator wells in the core of the main EDB plume north of 69EW0001 (69MW1283A/B, 69MW1284A/B, 69MW1304, 69MW1310, and 69MW1315) continue to show long-term declining trends. • EDB concentration fluctuations at wells located near the plume boundary north of 69EW0001 (69MW1310, 69MW1315) support the need for a plume boundary revision. • No EDB detections at 69MW1303A,B and 69MW1317A,B,C continue to support the conclusion that the main body of the FS-28 plume is being captured by 69EW0001. • Multiple rounds of sub-MMCL or no detections of EDB in monitoring wells selected to monitor the main EDB plume support the need for a monitoring network optimization evaluation.

ITEM	REMARKS

Residual EDB Concentrations Near SWP System

- No EDB detections at wells screened shallow in the aquifer near former SWP system with the exception of 69MW0033A where EDB was detected at a BRL concentration in February 2012.
- The EDB concentration at 69MW0034A declined below the MMCL (0.017 µg/L on 16 February 2012) for the first time since sampling began in 2009.
- The monitoring data continue to support the decision to shut down and decommission the SWP system.
- Although no EDB MMCL exceedances were reported at wells in this area, the inferred depiction of the plume will remain. The depiction of the plume in this area will be reassessed following the next annual SPEIM sampling event scheduled for February 2013.

Deep Leading Edge Lobe

- The highest EDB concentrations in the deep leading edge lobe have historically been reported at 69MW1318A; the EDB concentration trend at this well has shown a steady decline from 3.7 µg/L in December 2003 to 0.303 µg/L in September 2007 to BRL of 0.01 µg/L in April 2009; a temporary increase in the EDB concentration to 0.028 µg/L was observed in January 2010. No EDB was detected at this well when subsequently sampled on 22 February 2011 and 09 February 2012.
- EDB concentrations at 69MW1306A,C declined below the MMCL based on the February 2012 sampling round.
- The EDB concentration trends at 69MW1318A and 69MW1306A,C support the conclusion that the trailing edge of the deep plume lobe has migrated past these locations. As such, a plume boundary revision is recommended.
- Multiple rounds of sub-MMCL or no detections of EDB have been observed in wells selected to monitor the area between the main EDB plume and the deep lobe. Based on these data, a monitoring network optimization is recommended.

Shallow Leading Edge Lobe

- No EDB has been detected at monitoring wells 69PZ0005B and 69PZ0019B located within the former shallow leading edge lobe since September 2007 (four consecutive annual sampling events). The need to continue monitoring in this area should be assessed as part of the recommended monitoring network optimization.

ITEM	REMARKS

Surface Water Results

- EDB was detected at 69SW2007 at a BRL concentration in June 2011; no EDB was detected at this location during the subsequent sampling event in August 2011.
- No EDB was detected at any other surface water network locations during 2011 and data did not identify the need to sample cranberries.

ETD System Performance

An overview of ETD system performance for the reporting period was also presented by providing treatment system influent concentration trends for 69EW0001 and 69EW0002, EDB mass removal, frequency of carbon exchanges, extraction well operational rates, volume of treated water, and electrical usage/air emissions associated with the operation of the system.

69EW0002 Performance Monitoring

Performance monitoring data collected in the area of extraction well 69EW0002 were reviewed during the presentation. The main finding are as follows:

- EDB was not detected at any monitoring wells selected to assess the extent of the deep leading edge lobe near 69EW0002 and the remedial performance of 69EW0002.
- However, EDB continues to be detected in the influent at 69EW0002 (currently operating at 75 gpm); EDB influent concentrations at 69EW0002 have declined from 0.047 µg/L in February 2011 to 0.020 µg/L in February 2012.
- The influent data collected at 69EW0002 indicate that EDB contamination remains within the hydraulic capture zone of the extraction well but is not being detected in monitoring network.
- A continuation of no EDB detections at 69MW0032A,B located downgradient of 69EW0002 support the conclusion that the extraction well is capturing and cutting off this deep lobe of the EDB plume.
- EDB was not detected at monitoring well 69MW0028A on 15 February 2012 (a decline from 0.011 µg/L on 18 February 2011) indicating that the EDB plume located downgradient and outside of the capture zone of 69EW0002 is attenuating as expected.
- The monitoring data collected in the vicinity of 69EW0002 indicate that the extent of the plume is reducing; however, remaining EDB contamination is being captured by 69EW0002; and therefore, this well should continue operating.

ITEM	REMARKS

4.0 SPEIM NETWORK OPTIMIZATION

A proposal to optimize the FS-28 SPEIM network was included in the data presentation at the 20 June 2012 Technical Update meeting. Details of the rationale and results of the monitoring network optimization are included in Attachment A along with the proposed optimized network (Figure 10 and Table 1 in Attachment A).

The monitoring network optimization consisted of modifications to the SPEIM chemical network which is used to monitor EDB concentrations in groundwater in the FS-28 plume. No changes to the surface water monitoring network were recommended. A summary of the network optimization recommendations presented is as follows:

- Discontinue monitoring at the following six monitoring wells located north/northwest of the main EDB plume due to multiple rounds of sub-MMCL or no EDB detections
    - 69MW1272, 69MW1400A, 69MW1401, 69MW1404, 69MW1411, 69MW1416
- Discontinue monitoring at the following five monitoring wells located outside or above the main EDB plume boundary due to multiple rounds of sub-MMCL or no EDB detections
    - 69MW1278, 69MW1311, 69MW1312, 69MW1313, 69MW1316
- Discontinue monitoring at the following 12 monitoring wells/piezometers located in area between main EDB plume and deep leading edge lobe due to multiple rounds of sub-MMCL or no EDB detections
    - 69MW1290A/B, 69MW1291B, 69PZ1291A, 69MW1294, 69MW1296A, 69MW1297, 69PZ1298A, 69MW1302, 69PZ1302A, 69PZ1308A, 69PZ0023A
- Discontinue monitoring at the following two piezometers selected to monitor the former shallow leading edge lobe due to multiple rounds of no EDB detections
    - 69PZ0005B, 69PZ0019B
- Reduce the monitoring frequency from semiannual to annual at the following seven monitoring wells/piezometers selected to monitor leading edge lobe near 69EW0002
    - 69PZ0017A, 69MW0029A,B, 69MW0030A, 69MW0031A, 69MW0032A,B

ITEM	REMARKS

5.0 CONCLUSIONS/RECOMMENDATIONS

Conclusions

Based on the SPEIM data summarized in the 20 June 2012 data presentation, the following conclusions can be drawn:

- SPEIM data continue to support the conclusion that 69EW0001 is successfully capturing the main FS-28 EDB plume.
- The observed decline in influent EDB concentrations at 69EW0001 over the past several years is likely attributed to the overall decline in EDB concentrations within the plume rather than an indication that the extraction well should be optimized; however, continued evaluation of performance monitoring data should be conducted.
- The maximum detected EDB concentration in main body of the plume is now 0.933 µg/L (declining from 1.71 µg/L in 2010 and 1.1 µg/L in 2011).
- EDB data collected at monitoring wells screened shallow in the aquifer near the former SWP system continue to support the decision to shut down the system. If EDB concentrations in this area remain below the MMCL during the next annual SPEIM sampling event (scheduled for February 2013), this portion of the plume will no longer be depicted.
- Surface water data collected in 2011 did not identify a need to sample cranberries.
- ETD system performance monitoring data are consistent with the conceptual site model, remedial goals are being met, and remediation is progressing as expected; no system operation changes are needed at this time; however, continued evaluation of performance monitoring data should be conducted to identify optimization opportunities.
- A review of the SPEIM data indicated that a monitoring network optimization evaluation was warranted. The evaluation identified 25 locations where monitoring should cease based on multiple rounds of sub-MMCL EDB concentrations or no EDB detections. In addition, the monitoring frequency at seven locations should be adjusted from semiannual to annual (Figure 10 and Table 1 of Attachment A).
- Minor plume boundary revisions are needed as shown on Figure 10 of Attachment A. However, these changes do not require modification to the FS-28 Land Use Control boundary.

Recommendations

Recommendations are as follows:

- Update FS-28 plume boundary as depicted on Figure 10 in Attachment A.
- Optimize the SPEIM groundwater monitoring network as presented on Figure 10 and Table 1 in Attachment A.

ITEM	REMARKS
	• AFCEC will continue with following planned SPEIM activities: o Perform surface water monitoring in June and August 2012 o Perform annual Coonamessett Water Supply Well sentry well sampling in October 2012 o Perform annual SPEIM sampling event in February 2013 o Perform routine monthly remedial system performance monitoring o Present sampling results at Technical Update meetings
6.0	**REGULATOR COMMENTS/ACTION ITEMS** During the data presentation on 20 June 2012, the performance monitoring data collected near 69EW0002 was discussed with the regulatory agencies. Based on this discussion, it was agreed that the flow rate at 69EW0002 should be reduced to its original design flow rate of 50 gpm (from 75 gpm). Performance monitoring data collected at the wells in the vicinity of 69EW0002 indicate that the plume is not contiguous in this area and a return to the original flow rate at this well is appropriate to continue capturing the remaining contamination. The flow rate at 69EW0002 was adjusted on 22 August 2012; this revised operating condition will be referred to as 2012 Scenario 01 (69EW0001 at 550 gpm and 69EW0002 at 50 gpm). AFCEC checked in with the regulatory agencies at the 27 September 2012 Technical Update meeting to inquire whether any additional comments or action items were identified during their review of the data presentation materials. No additional comments were received. At this follow up meeting, AFCEC provided the agencies with the 2012 Coonamessett River surface water sampling results. No EDB was detected at any of the surface water locations and therefore cranberry sampling was not needed. A figure that presents these surface water sampling results is included as Attachment C. Regulator concurrence on the FS-28 SPEIM chemical monitoring network revisions were received via e-mail on 22 June 2012 (MassDEP) and 05 July 2012 (U.S. EPA). Copies of the e-mail correspondence are included as Attachment B.
7.0	**REFERENCES** AFCEE. 2012 (March). *Fuel Spill-28 2011 Summary Letter Report.* 420005-SPEIM-FS28-SLR-001. Prepared by CH2M HILL for AFCEE/MMR, Installation Restoration Program, Otis ANG Base, MA. _____. 2011 (March). *Fuel Spill-28 2010 Summary Letter Report.* 404929-SPEIM-FS28-SLR-001. Prepared by CH2M HILL for AFCEE/MMR, Installation Restoration Program, Otis ANG Base, MA.

ITEM	REMARKS
8.0	**CONCURRENCE** Concurrence with the FS-28 ETD system 2012 Scenario 01 operating conditions (69EW0001 at 550 gpm and 69EW0002 at 50 gpm), the FS-28 2012 plume boundary, and the optimized FS-28 SPEIM chemical monitoring network (Figure 10 and Table 1 of Attachment A) is represented by the signatures below: Roland Im 28 Nov 12 U.S. EPA Representative 12/6/12 MassDEP Representative 28 Nov 12 AFCEC Project Manager Note: The parties involved will retain the ability to modify the remedial system operation and/or the monitoring program based on field observations or other mutually agreeable technical justifications.

Attachments:
Attachment A. FS-28 2012 Triennial SPEIM Data Presentation, 20 June 2012 Technical Update Meeting
Attachment B. Regulatory Approval of the FS-28 SPEIM Monitoring Network Optimization Recommendations
Attachment C. FS-28 Surface Water Results, June and August 2012

ATTACHMENT A

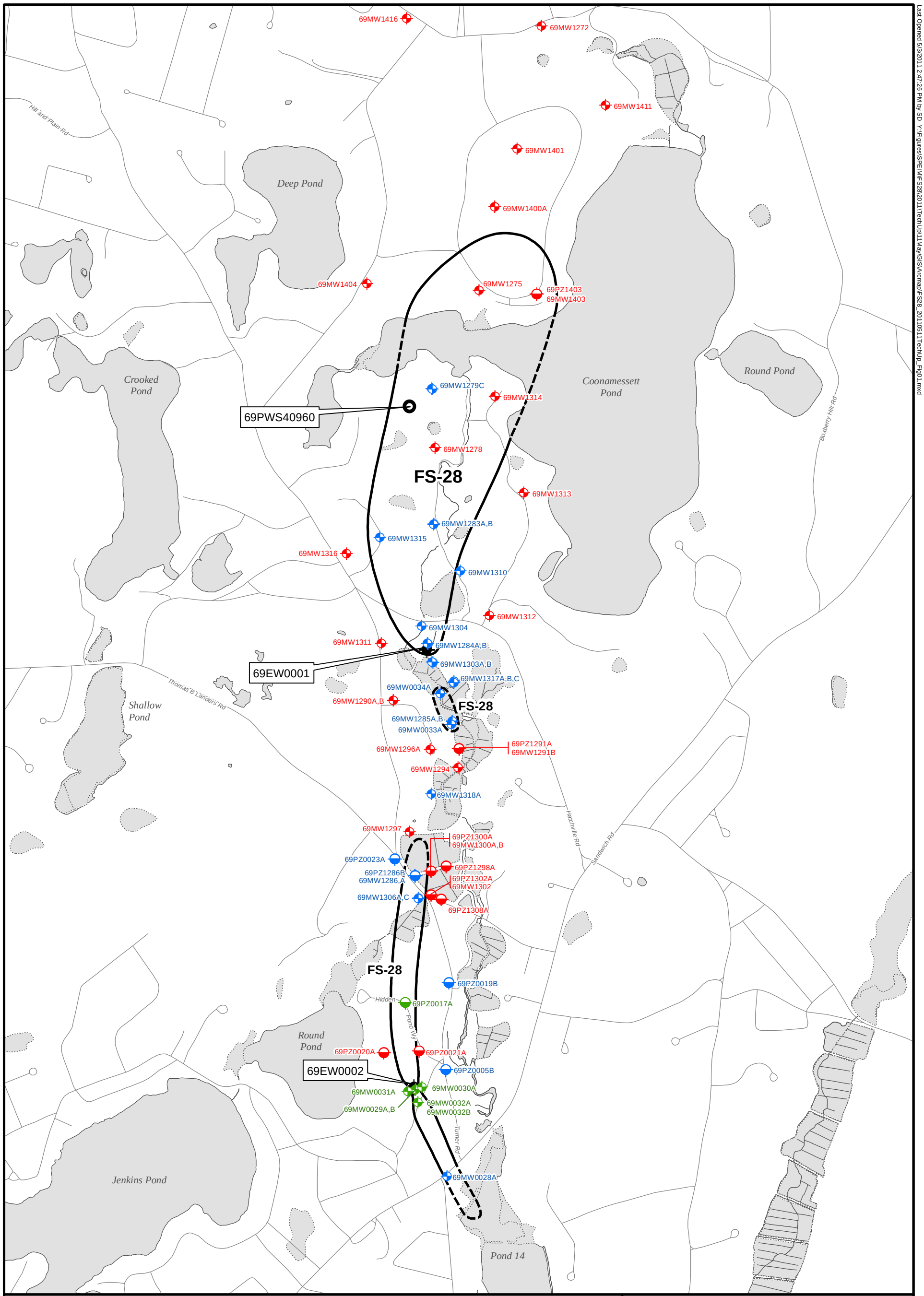
FS-28 2012 Triennial SPEIM Data Presentation, 20 June 2012 Technical Update Meeting

FS-28 2012 Triennial SPEIM Data Presentation

20 June 2012 Technical Update Meeting

Overview

- Groundwater sampling results for January-February 2012
  (locations shown on Figure 1)
- 64 monitoring wells sampled for EDB analysis
  - 31 triennial
  - 26 annual
  - 7 semiannual
- Surface water sampling at Coonamessett River locations for EDB analysis (June and August 2011)
  (locations shown on Figure 2)
- ETD System Performance Monitoring (Jan – Dec 2011)
- Monitoring Network Optimization
- Conclusions and Recommendations
- No Sampling Deviations



Data Source: AFCEE, May 2012, MMR-AFCEE Data Warehouse

Legend

- Monitoring Well
- Piezometer
- Public Water Supply Well
- Extraction Well
- Plume Boundary (Dashed Where Inferred)
- Bog/Wetland

Sampling Frequency:

- Annual
- Semiannual
- Triennial

N

0 460 920 Feet

FIGURE 1

FS-28 SPEIM GROUNDWATER CHEMICAL MONITORING NETWORK

AFCEE - Massachusetts Military Reservation

20 June 2012 Technical Update Meeting

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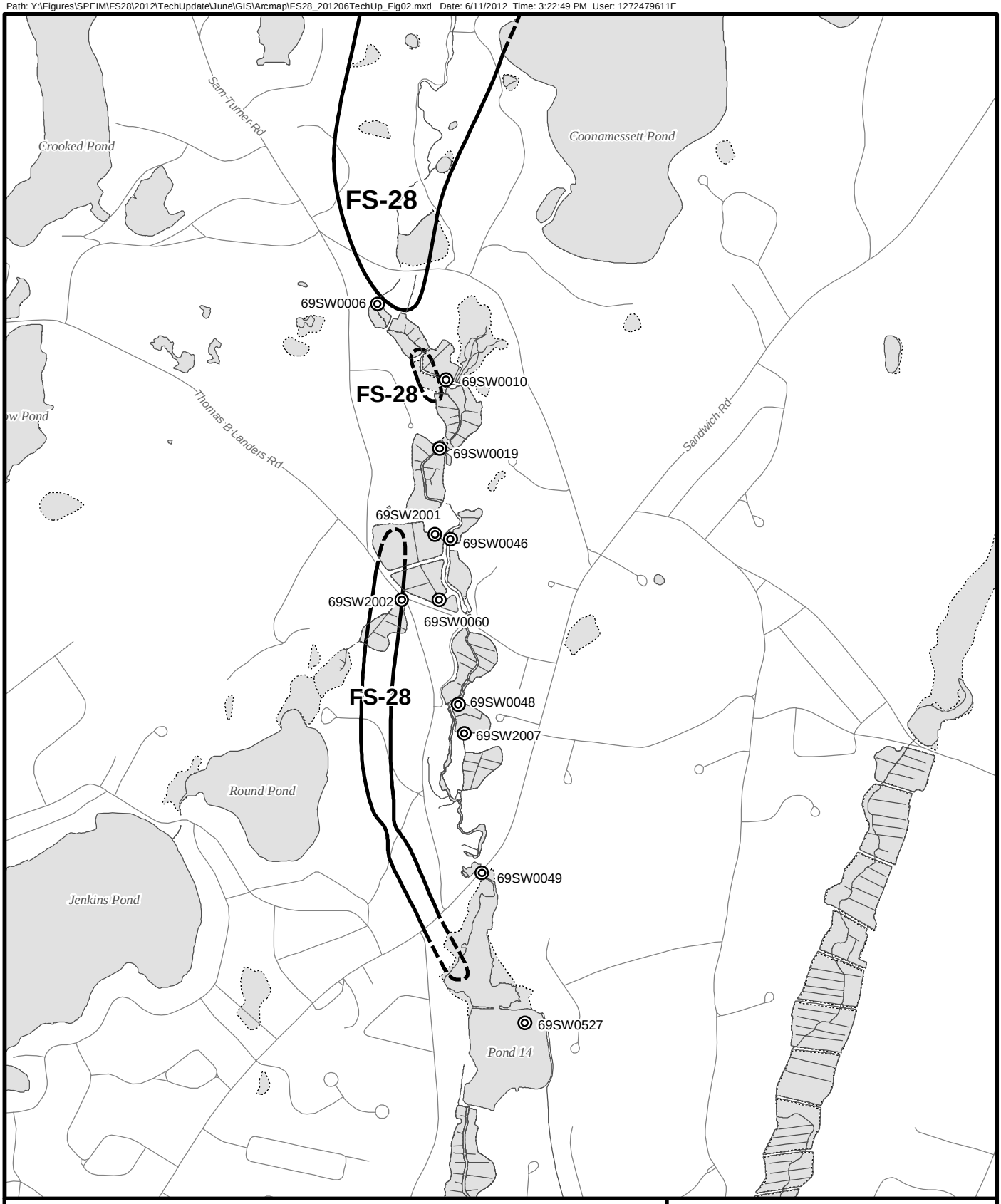
Path: Y:\Figures\SPEIM\FS28\2012\TechUpdate\June\GIS\Arcmap\FS28_201206TechUp_Fig02.mxd Date: 6/11/2012 Time: 3:22:49 PM User: 1272479611E



Data Source: AFCEE, February 2012, MMR-AFCEE Data Warehouse

Legend

- Surface Water Sampling Location
- Plume Boundary (Dashed Where Inferred)
- Bog/Wetland

N

0 570 1,140 Feet

FIGURE 2

FS-28 SPEIM SURFACE WATER CHEMICAL MONITORING NETWORK

AFCEE - Massachusetts Military Reservation

20 June 2012 Technical Update Meeting

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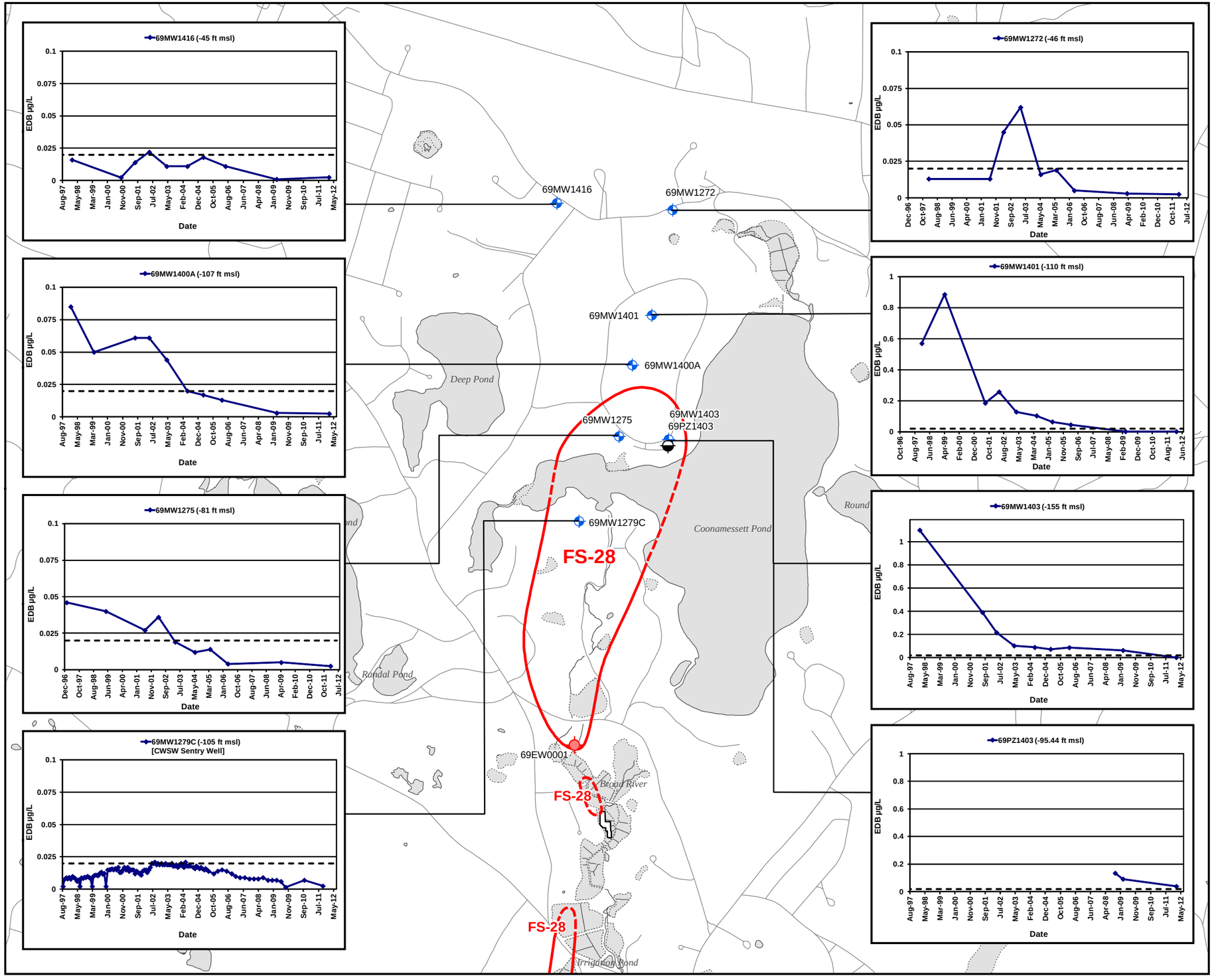
FS-28 Triennial SPEIM Data Presentation

Groundwater Highlights

Main EDB Plume (Distant from 69EW0001 and Trailing Edge – Figure 3a)

- Continued declining trend in EDB concentrations due to attenuation and migration of the plume trailing edge
- The trailing edge approaching the western arm of Coonamessett Pond
- The only well sampled in this northern area with EDB MMCL exceedance is 69PZ1403
- Sporadic BRL detections of EDB at 69MW1279C (Coonamessett Water Supply Well sentry well)
- Multiple rounds of sub-MMCL or no detections of EDB in monitoring wells selected to monitor the main EDB plume – network optimization is recommended



Legend

- Monitoring Well
- Piezometer
- Extraction Well
- 2009 Plume Boundary (Dashed Where Inferred)
- EDB MMCL (0.02 µg/L)
- Bog/Wetland

N

0 560 1,120 Feet

Data Source: AFCEE, May 2012, MMR-AFCEE Data Warehouse

FIGURE 3a

EDB CONCENTRATION TRENDS IN FS-28 GROUNDWATER

AFCEE - Massachusetts Military Reservation

20 June 2012 Technical Update Meeting

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FS-28 Triennial SPEIM Data Presentation

Groundwater Highlights

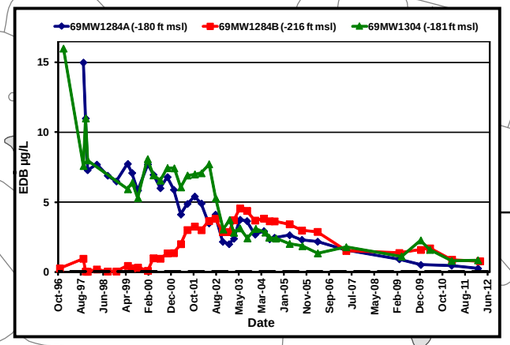
Main EDB Plume (Figure 3b)

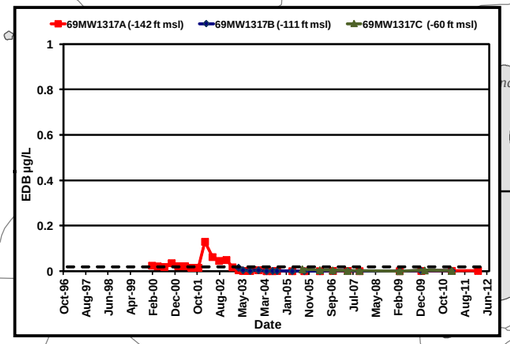
- EDB concentration trends at 7 key indicator wells in core of plume near 69EW0001

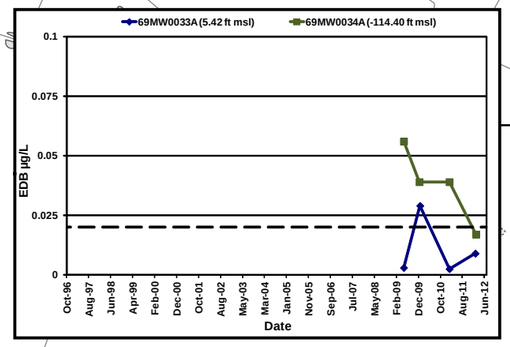
Monitoring Well LOC ID	EDB Concentration (µg/L)						
	April 2006	April 2007	March 2009	January 2010	May 2010	February 2011	February 2012
69MW1283A	1.05	1.18	0.464	1.09	0.604	0.40	0.425
69MW1283B	1.68	2.54	1.33	1.39	1.42	1.10	0.933
69MW1284A	2.19	1.56	0.931	0.524	NS	0.472	0.267
69MW1284B	2.89	1.53	1.38	1.60	1.71	0.90	0.786
69MW1304	1.35	1.79	1.13	2.28	1.60	0.811	0.859
69MW1310	0.256	0.025	0.013	0.028	NS	0.104	0.032
69MW1315	1.3	NS	0.148	0.028	NS	ND	ND

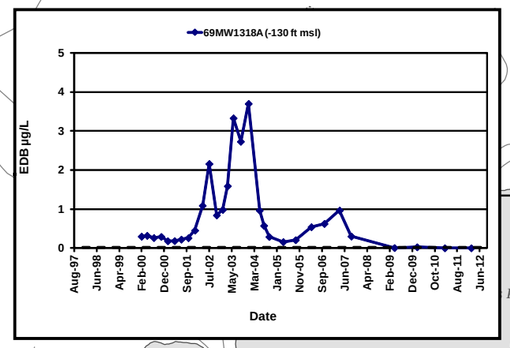
Notes:
1) NS = not sampled
2) ND = not detected

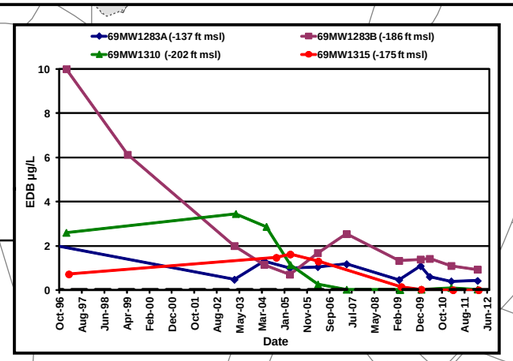
- Long-term downward trend at all of these indicator wells
- EDB concentration fluctuations at wells located near plume boundary (69MW1310, 69MW1315) – data support plume boundary revision
- No EDB detections at 69MW1303 and 69MW1317 clusters continue to support conclusion that main EDB plume is being captured by 69EW0001

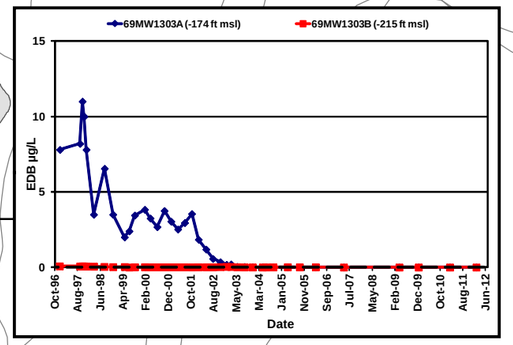


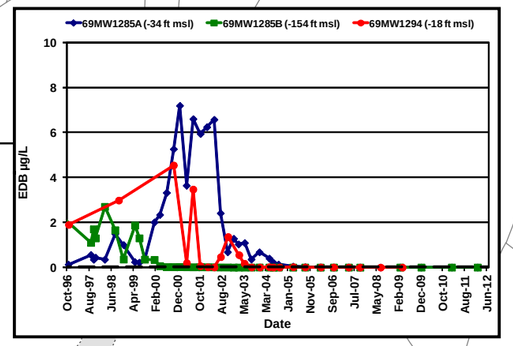


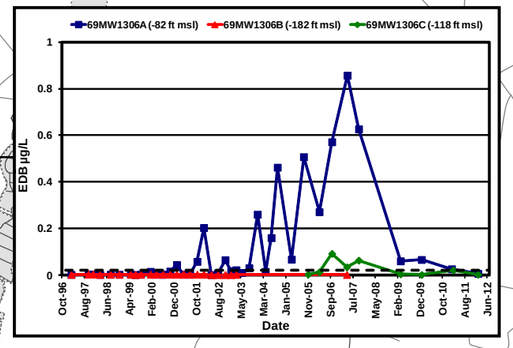












Legend

- Monitoring Well
- Piezometer
- Extraction Well
- EDB MMCL (0.02 µg/L)
- 2009 Plume Boundary (Dashed Where Inferred)
- Bog/Wetland

N

0 650 1,300

Feet

Data Source: AFCEE, May 2012, MMR-AFCEE Data Warehouse

FIGURE 3b

EDB CONCENTRATION TRENDS IN FS-28 GROUNDWATER

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Groundwater Highlights (cont.)

EDB data near Former Shallow Well Point (SWP) System (Figure 3b)

- No EDB detections at shallow screens located near former SWP system with exception of 69MW0033A
- EDB declined below the MMCL at 69MW0034A screened deep in the aquifer
- Summary of recent monitoring data near former the SWP system:
  - 69MW0033A (shallow): EDB detected at BRL on 05 June 2009; 0.029 µg/L on 14 Jan 2010; ND on 18 Feb 2011; BRL on 07 February 2012
  - 69MW1285A (shallow) and 69MW1285B (deep) both ND on 04 Jan 2010, 22 Feb 2011, and 07 February 2012
  - 69MW0034A (deep): EDB detected at 0.056 µg/L on 05 June 2009; 0.039 µg/L on 14 Jan 2010; 0.039 µg/L on 18 Feb 2011; 0.017 µg/L on 16 Feb 2012
- Data continue to support decision to shutdown SWP System in November 2008
- Inferred depiction of plume will remain; however 1 more round of sub-MMCL concentrations in monitoring network will support no further depictions of this plume lobe.

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Groundwater Highlights (cont.)

Deep Leading Edge EDB Lobe (Figure 3b)

- Highest EDB concentrations historically at 69MW1318A; steady decline from 3.7 µg/L in Dec 03 to 0.303 µg/L in Sept 07 to BRL in April 09; temporary increase above MMCL to 0.028 µg/L in Jan 2010; No EDB detected when sampled on 22 February 2011 and 09 February 2012
- EDB concentrations at 69MW1306 cluster now below MMCL
- EDB concentration trends at 69MW1318A and 69MW1306 cluster represents migration of the deep lobe trailing edge of deep lobe has migrated past these locations – data support plume boundary revision
- Multiple rounds of sub-MMCL or no detections of EDB in monitoring wells selected to monitor area between the main EDB plume and deep lobe – network optimization is recommended

Former Shallow Leading Edge EDB Lobe

- No EDB detections at 69PZ0005B and 69PZ00019B in shallow lobe since September 2007 (4 consecutive annual sampling events) – network optimization is recommended

REVIEW UPDATED CROSS-SECTIONS – Figures 4 through 7

Surface Water Highlights

- EDB detected at 69SW2007 at BRL concentration in June 2011; subsequent sampling event in August 2011 report no EDB
- No EDB detected at any other surface water network locations during 2011

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Northern Area

A

69MW1272

69PZ1401A,B
69MW1401

69MW1400A,B
69PZ1400A,B

FS-28

69MW1403
69PZ1403

69MW1314
69PZ1314A

Coonamessett Pond

69MW1278

69PZ1283A,B,C
69MW1283A,B

Coonamessett R.

69MW1304
69PZ1304A,B

69PZ1284A,B
69MW1284A,B

69EW0001

69PZ1303A,B,C
69MW1303A,B

69MW1317A,B,C
69PZ1317A

aa'

Upper Baptiste Bog

Broad River Marsh

Wetland 1285

Vernal Pool 390

FS-28

Lower Baptiste Bog

Raspberry Path
Loonstead Dr
Coonamessett Cir
Manor Ln
Hatchville Rd
Sam Turner Rd

0 360 720 Feet

Southern Area

FS-28

aa'

69DP0149
69MW0034A

Upper Baptiste Bog

Broad River Marsh

Wetland 1285

69PZ1285C
69MW1285A,B
69MW0033A

69DP0147

Vernal Pool 390

69MW1291A,B
69PZ1291A,B,C

69MW1294

69PZ1318,A
69MW1318

Lower Baptiste Bog

Coonamessett R.

Augusta Bog

Adams Bog

69MW1286,A
69PZ1286B

Romano Bog

69MW1306A,B,C

West Thompson Bog

East Thompson Bog

Chaston Bog

69PZ0017A,B

Round Pond

B'

69EW0002

B

69PZ0005A,B

69MW0031A

69MW0029A,B,C

69MW0032A,B

69MW0028A

A'

Pond 14

Thomas B Landers Rd
Turner Rd
Hatchville Rd
Hidden Pond Way
Sandwich Rd
Round Pond Dr
Pinecrest Beach Dr
Wedgewood Dr

0 340 680 Feet

Data Source: AFCEE, May 2012, MMR-AFCEE Data Warehouse

Legend

- Direct Push Location
- Extraction Well
- Monitoring Well
- Piezometer
- Shallow Wellpoints
- Transect
- FS-28 2009 EDB Plume Boundary (Dashed Where Inferred)
- Bog/Wetland

N

FIGURE 4

FS-28 PLUME AND LOCATION OF CROSS-SECTION LINES

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NORTH

A

SOUTH

aa'

69MW1272

69MW1401
69PZ1401A,B

69MW1400A,B
69PZ1400A,B

69MW1403
69PZ1403

69MW1314
69PZ1314A

69MW1278

69MW1283A,B
69PZ1283A,B,C

69MW1304
69PZ1304A,B

69MW1284A,B
69PZ1284A,B

69EW0001

69MW1303A,B
69PZ1303A,B,C

69MW1317A,B,C
69PZ1317

Coonamessett Pond

ELEVATION (FEET MEAN SEA LEVEL)

Data Source: AFCEE, May 2012, MMR-AFCEE Data Warehouse.

Legend

- Monitoring Well
- A — Well screen ID
- Extraction Well
- Piezometer
- ND — Not Detected
- NS — Not Sampled
- Water table
- 12 — Monitoring Well EDB Results (µg/L) (Collected in 2012)
- 0.02 — EDB Plume Boundary (MMCL = 0.02 µg/L)
- Screen Closed (Packered)
- Bedrock

0 Feet — V: 60 H: 600

FIGURE 5

FS-28 CROSS-SECTION A - aa'

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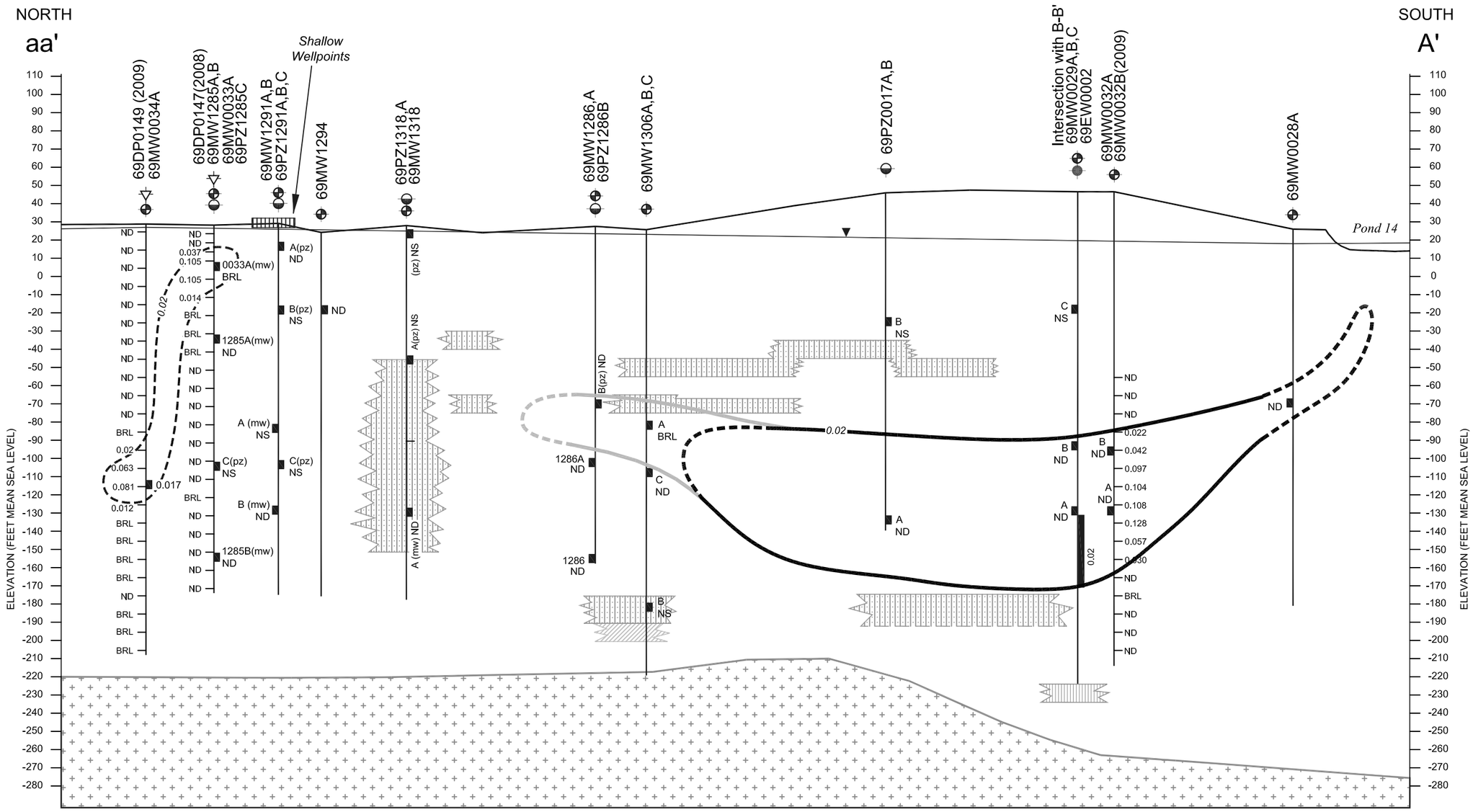

Legend

- Monitoring Well
- Piezometer
- Extraction Well
- Direct Push Location
- Water Table
- A — Well Screen ID
- NS — Not Sampled
- ND — Not Detected
- BRL — Below Reporting Limit
- 0.02 — 2009 Plume Boundary (Dashed Where Inferred) (MMCL = 0.02 µg/L)
- 0.02 — 2012 Plume Boundary (Dashed Where Inferred) (MMCL = 0.02 µg/L)
- 0.162 — Monitoring Well EDB Results (µg/L) (Collected in 2012)
- 1.14 — Direct Push EDB Screening Data (µg/L)
- Silt
- Silty Sand
- Bedrock
- Clay

Data Source: AFCEE, May 2012, MMR AFCEE Data Warehouse

NOTE: Lithology at direct push locations is inferred from purge water observations. Date of borehole screening data is noted on figure.

V: 60
H: 480
0 Feet

FIGURE 6

FS-28 CROSS-SECTION aa'-A'

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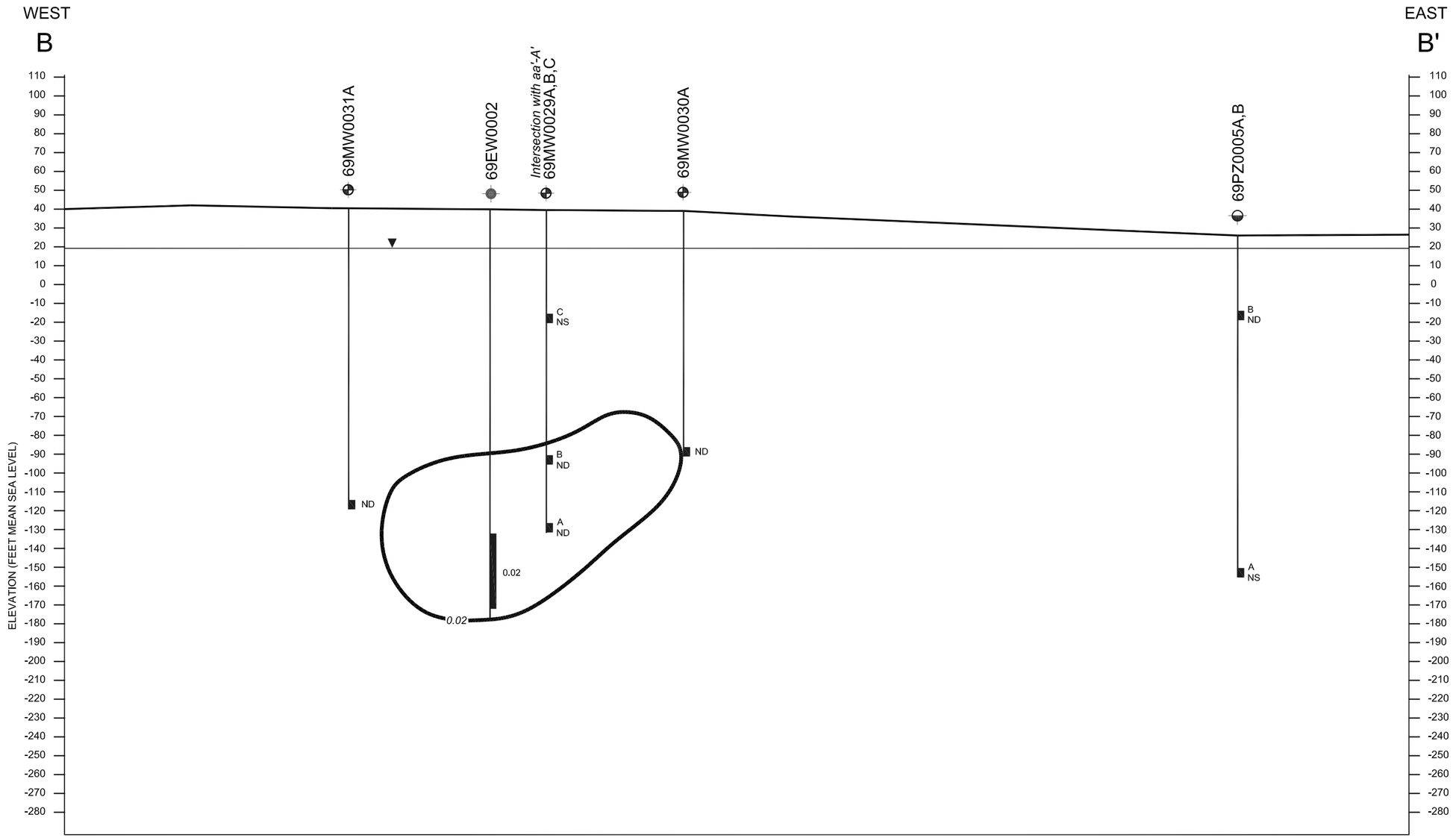

Legend

- Monitoring Well
- Piezometer
- Extraction Well
- Water Table
- A — Well Screen ID
- NS — Not Sampled
- ND — Not Detected
- 0.02 — Plume Boundary (MMCL = 0.02 µg/L)
- 0.162 — Monitoring Well EDB Results (µg/L) (Collected in 2012)

Data Source: AFCEE, May 2012, MMR AFCEE Data Warehouse

0 V: 60 H: 60 Feet

FIGURE 7

FS-28 CROSS-SECTION B-B'

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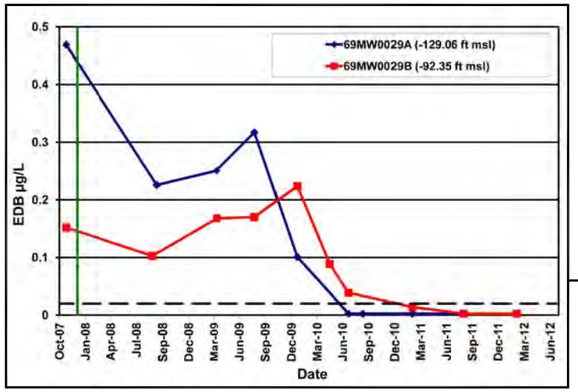
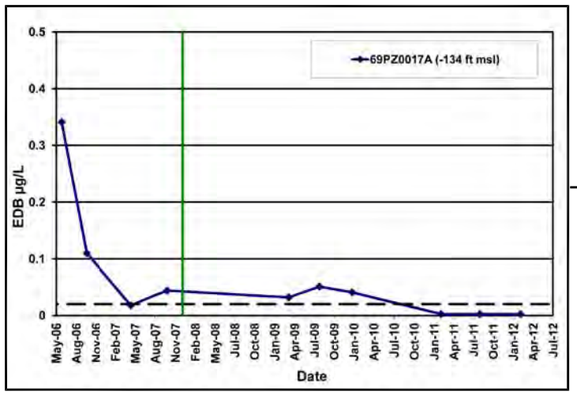
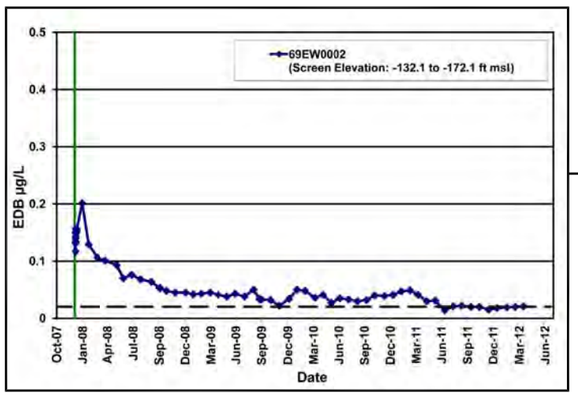
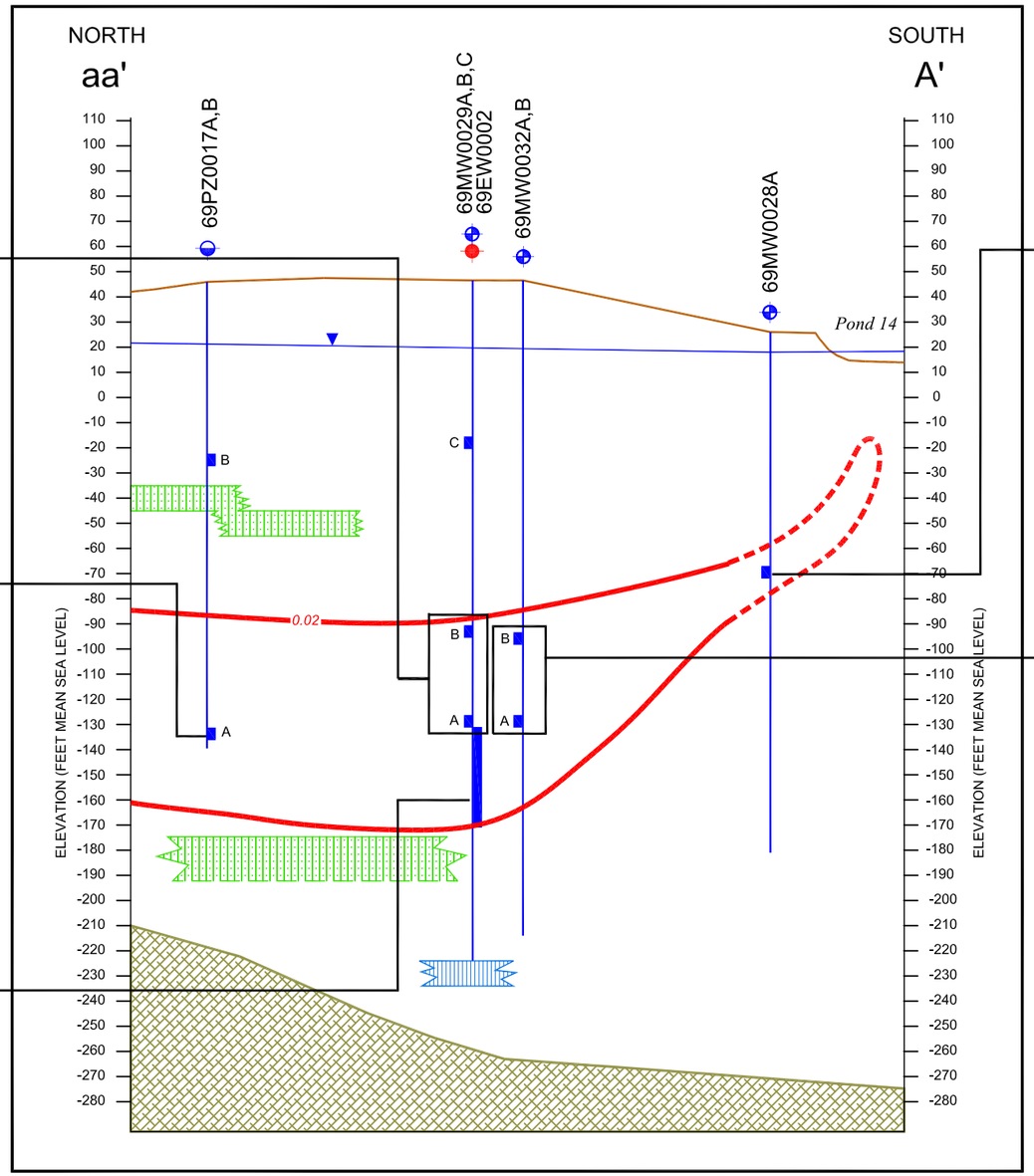
69EW0002 Performance Monitoring Data –(Figures 6, 7, 8)

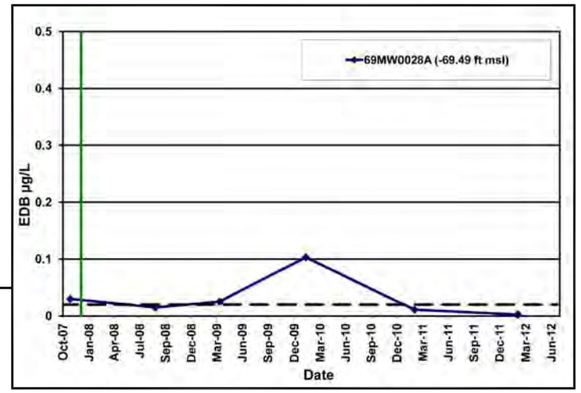
- No detections of EDB any monitoring wells selected to assess extent of deep leading edge lobe and the remedial performance of 69EW0002
- However, EDB continues to be detected in the influent at 69EW0002 (currently operating at 75 gpm)
- EDB influent concentrations declined from 0.047 µg/L in Feb 2011 to 0.02 µg/L in February 2012
- 69EW0002 influent data indicates EDB contamination remains within the capture zone of the extraction well but is not being detected in monitoring network.
- Continued EDB non-detects at 69MW0032A,B located downgradient of 69EW0002 support conclusion that extraction well is capturing and cutting off the plume
- EDB not detected on 15 February 2012 at downgradient monitoring well 69MW0028A (declined from 0.011 µg/L on 18 Feb 2011)
- No EDB detected at upgradient flanking wells 69PZ0020A and 69PZ0021A
- Continued operation of 69EW0002 appropriate; recommend network optimization

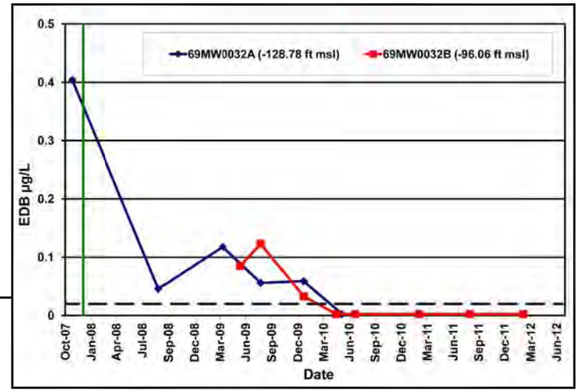


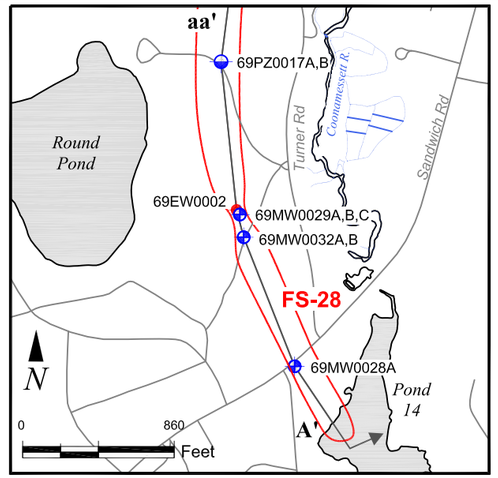












Legend

- Monitoring Well
- Piezometer
- Extraction Well
- Water Table
- A Well Screen ID
- Silt
- Silty Sand
- Bedrock
- 0.02 Plume Boundary (Dashed Where Inferred) (MMCL = 0.02 µg/L)
- Startup of 69EW0002 (11 December 2007)
- EDB MMCL (0.02 µg/L)

Data Source: AFCEE, May 2012, MMR AFCEE Data Warehouse

0 V: 60 H: 480 Feet

FIGURE 8

FS-28 PERFORMANCE MONITORING DATA - 69EW0002 AREA

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FS-28 Remedial System Performance Monitoring Data (Figure 9)
(January 2011 – December 2011)

- 69EW0001 influent EDB concentrations ranged from 0.068 to 0.171 µg/L.

Average 69EW0001 Influent EDB Concentrations (µg/L)						
2005 (550 gpm)	2006 (550 gpm)	2007 (550 gpm)	2008 (550 gpm)	2009 (550 gpm*)	2010 (550 gpm)	2011 (550 gpm)
0.383	0.307	0.244	0.196	0.159	0.134	0.105

*Well packered on 11 June 2009; flow rate remained at 550 gpm

- Gradual downward trend in average influent concentrations at 69EW0001 primarily attributed to decline in EDB concentrations in core of main plume.
- 69EW0002 influent EDB concentrations ranged from 0.014 to 0.049 µg/L.

Average 69EW0002 Influent EDB Concentrations (µg/L)			
2008 (50 gpm)	2009 (50 gpm)	2010 (75 gpm*)	2011 (75 gpm)
0.075	0.038	0.038	0.028

*Flow rate increased from 50 to 75 gpm on 07 October 2010

- Declining average influent EDB concentration at 69EW0002 in 2011 indicates plume concentrations decreasing and approaching RAO of aquifer restoration.
- Continue to operate ETD system under current configuration (2010 Scenario 01) and continue to monitor performance.

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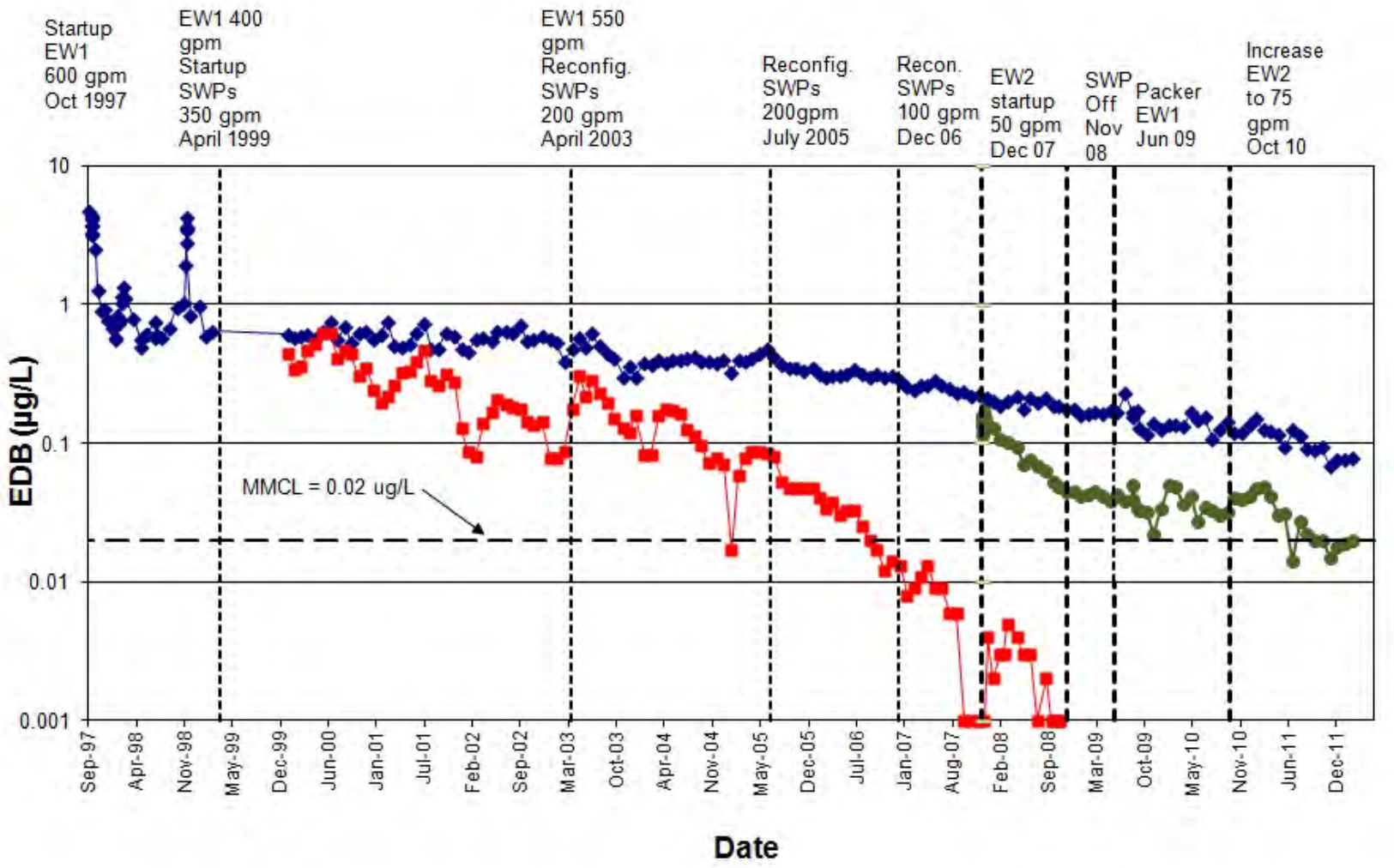

Data Source: AFCEE, May 2012, MMR-AFCEE Data Warehouse

Legend

- 69EW0001
- 69PLT01023 (Shallow Wellpoint Combined Influent)
- 69EW0002
- MMCL = 0.02 µg/L

FIGURE 9

FS-28 REMEDIAL SYSTEM INFLUENT EDB CONCENTRATION TRENDS

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FS-28 Remedial System Operational Summary

(Operational Period: January 2011 – December 2011)

- Approximately 310 million gallons of groundwater treated
- 5 carbon exchanges (13 January, 09 March, 10 May, 18 July, 19 October)
- 0.246 pounds of EDB removed (Jan 11 – Dec 11)
  - 0.237 pounds (96.3%) EDB removed by 69EW0001 (88% of system flow)
  - 0.009 pounds (3.7%) EDB removed by 69EW0002 (12% of system flow)
- Well Performance
- 69EW0001 operated at 94% of design flow of 500 gpm
- 69EW0002 operated at 95% of design flow of 75 gpm

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FS-28 Remedial System Operational Summary

(Operational Period: January 2011 – December 2011)

ETD System Electrical Usage and Air Emissions

- COC mass removed by ETD system = 0.246 lbs
- Estimated VOC mass potentially emitted assuming traditional New England power mix = 20 lbs
- Estimated VOC mass emitted considering contributions from AFCEE wind turbines and green power purchases = 0.6 lbs

FS-28 Remedial System Electrical Consumption and Associated Air Emissions

		1/1/2011 to 12/31/2011	System Startup (11/1997) to 12/31/2011
Volume of Groundwater Treated (million gallons)		**310**	**4,919**
Groundwater COC Mass Removal (pounds)		**0.246**	**14.682**
Electrical Usage (MWh)		**413**	**7,232**
Estimated Air Emissions[1] (based on electrical usage)	**CO_2 (tons)**	271	5,876
	NOx (lbs)	582	9,274
	PM-10 (lbs)	33	351
	SO_2 (lbs)	1,553	11,037
	VOCs (lbs)	20	432
Estimated Reduction in Air Emissions due to Green Power Purchases[2]	**CO_2 (tons)**	135	513
	NOx (lbs)	291	1,000
	PM-10 (lbs)	17	51
	SO_2 (lbs)	776	2,226
	VOCs (lbs)	10	38
Estimated Reduction in Air Emissions due to MMR Wind Turbine Operation[3]	**CO_2 (tons)**	128	171
	NOx (lbs)	275	368
	PM-10 (lbs)	15.7	21.1
	SO_2 (lbs)	732	982
	VOCs (lbs)	9.6	12.9
Estimated Total Air Emissions with consideration of Green Power Purchases and MMR Wind Turbine Operation	**CO_2 (tons)**	**8**	**5,192**
	NOx (lbs)	**17**	**7,905**
	PM-10 (lbs)	**1.0**	**279**
	SO_2 (lbs)	**44**	**7,828**
	VOCs (lbs)	**0.6**	**381**

Notes:

1) The estimated air emissions presented in this table are based on the assumption that until 4/30/2009, the power used to operate the MMR remedial systems was provided by the Mirant Canal Station power plant in Sandwich, MA. This power plant primarily produced electricity generated by the combustion of fuel oil and has been off-line since 5/1/2009. Starting on 5/1/2009, air emissions are based on electricity generated by the average mix of power sources in Massachusetts. Air emissions were calculated using MMR utility data from AFCEE's Metrix 4 Utility Accounting Software (http://www.abraxasenergy.com/metrix4.php) and emission factors obtained from the following websites:
http://www.csgnetwork.com/elecpowerpolcalc.html
http://www.metrixcentral.com/EmissionsCalculator/Emissions%20Factors%202004.pdf

2) Emissions offset by purchases of electricity from renewable sources beginning 7/1/2008.

3) Emissions offset by operation of AFCEE-owned wind turbines beginning on 12/2/2009 (Wind I) and 11/1/2011 (Wind II).

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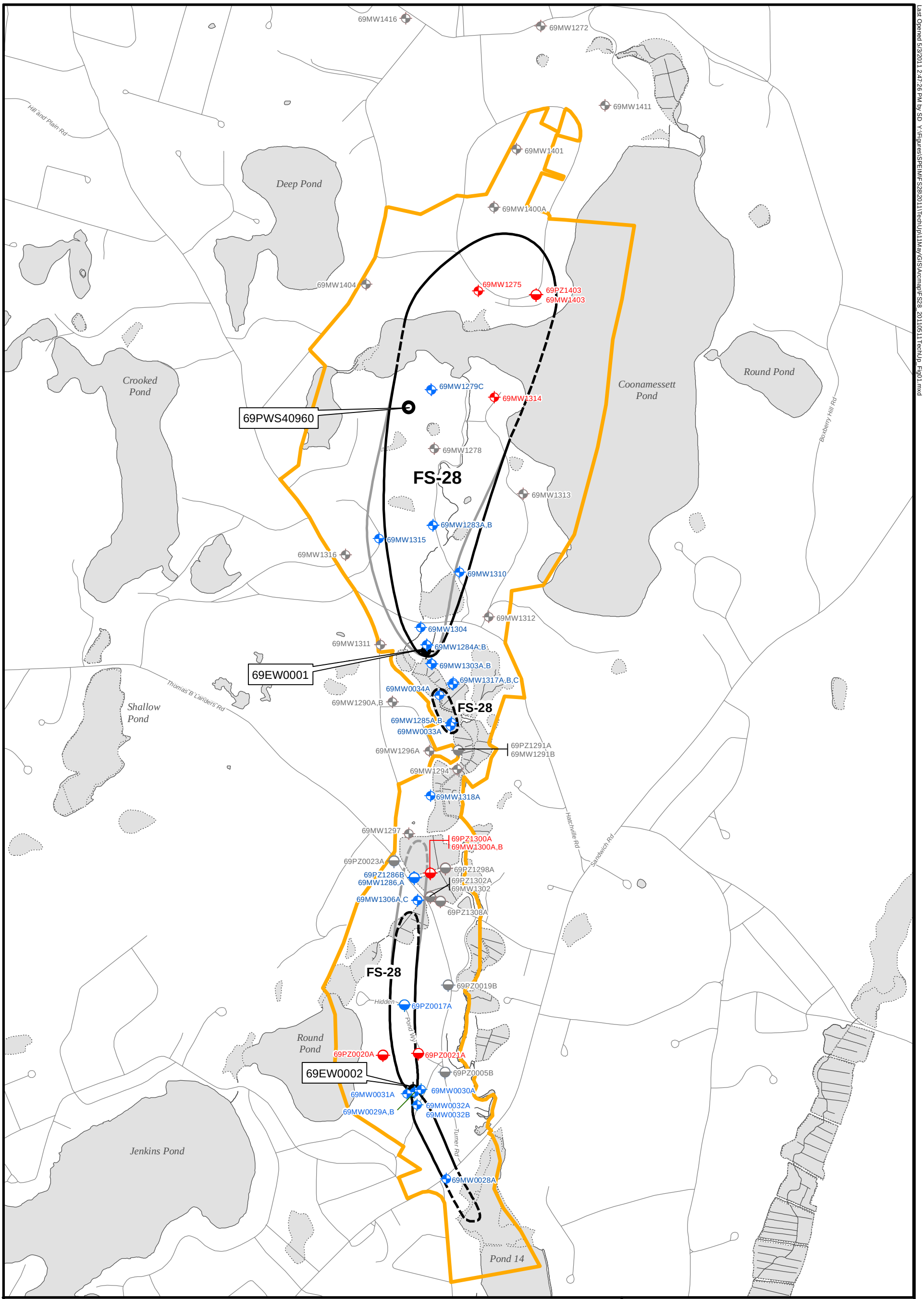
Groundwater Monitoring Network Optimization (Figure 10, Table 1, Table 2)

- Discontinue monitoring at 6 monitoring wells located north/north west of the main EDB plume due to multiple rounds of sub-MMCL or no EDB detections
  - 69MW1272, 69MW1400A, 69MW1401, 69MW1404, 69MW1411, 69MW1416
- Discontinue monitoring at 5 monitoring wells located outside or above the main EDB plume boundary due to multiple rounds of sub-MMCL or no EDB detections
  - 69MW1278, 69MW1311, 69MW1312, 69MW1313, 69MW1316
- Discontinue monitoring at 12 monitoring wells/piezometers located in area between main EDB plume and deep leading edge lobe due to multiple rounds of sub-MMCL or no EDB detections
  - 69MW1290A,B, 69MW1291B, 69PZ1291A, 69MW1294, 69MW1296A, 69MW1297, 69PZ1298A, 69MW1302, 69PZ1302A, 69PZ1308A, 69PZ0023A
- Discontinue monitoring at 2 piezometers selected to monitor the former shallow leading edge lobe due to multiple rounds of no EDB detections
  - 69PZ0005B, 69PZ0019B
- Reduce monitoring frequency from semiannual to annual at 7 monitoring wells/piezometers selected to monitor leading edge lobe near 69EW0002
  - 69PZ0017A, 69MW0029A,B, 69MW0030A, 69MW0031A, 69MW0032A,B



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Data Source: AFCEE, May 2012, MMR-AFCEE Data Warehouse

Legend

- Monitoring Well
- Piezometer
- Public Water Supply Well
- Extraction Well
- FS-28 LUC Boundary
- 2009 Plume Boundary (Dashed Where Inferred)
- 2012 Plume Boundary (Dashed Where Inferred)
- Bog/Wetland

Sampling Frequency:

- Annual
- Not Monitored
- Triennial

N

0 460 920 Feet

FIGURE 10

UPDATED FS-28 PLUME BOUNDARY AND OPTIMIZED SPEIM GROUNDWATER CHEMICAL MONITORING NETWORK

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Table 1
FS-28 Optimized Chemical Monitoring Network - June 2012
20 June 2012 Technical Update Meeting

Location	Monitoring Rationale	Current Frequency	Optimized Frequency	Parameters
Groundwater Monitoring Network				
69MW0028A	Monitor the leading edge of the deep plume lobe near Sandwich Road	A	A	EDB
69MW0029A	Performance monitoring for 69EW0002	SA	A	EDB
69MW0029B	Performance monitoring for 69EW0002	SA	A	EDB
69MW0030A	Performance monitoring for 69EW0002	SA	A	EDB
69MW0031A	Performance monitoring for 69EW0002	SA	A	EDB
69MW0032A	Performance monitoring for 69EW0002	SA	A	EDB
69MW0032B	Performance monitoring for 69EW0002	SA	A	EDB
69MW0033A	Monitor between 69EW0001 and former SWPs	A	A	EDB
69MW0034A	Monitor between 69EW0001 and former SWPs	A	A	EDB
69MW1272	Monitor the trailing edge of northern part of the main EDB plume	TE	NS	
69MW1275	Monitor the northern part of the main EDB plume	TE	TE	EDB
69MW1278	Monitor the plume between Coonamessett Pond and Hatchville Road	TE	NS	
69MW1279C	CWSW sentry wells	A	A	EDB
69MW1283A	Monitor the plume between Coonamessett Pond and Hatchville Road	A	A	EDB
69MW1283B	Monitor the plume between Coonamessett Pond and Hatchville Road	A	A	EDB
69MW1284A	Monitor the plume upgradient of 69EW0001	A	A	EDB
69MW1284B	Monitor the plume upgradient of 69EW0001	A	A	EDB
69MW1285A	Monitor between 69EW0001 and former SWPs	A	A	EDB
69MW1285B	Monitor between 69EW0001 and former SWPs	A	A	EDB
69MW1286	Monitor deep leading edge plume lobe (deep boundary)	A	A	EDB
69MW1286A	Monitor deep leading edge plume lobe (core)	A	A	EDB
69MW1290A	Monitoring to support capture of western side of main EDB plume by 69EW0001.	TE	NS	
69MW1290B	Monitoring to support capture of western side of main EDB plume by 69EW0001.	TE	NS	
69MW1291B	Monitor the trailing edge of the deep leading edge plume lobe	TE	NS	
69MW1294	Monitor the plume downgradient of shallow well points	TE	NS	
69MW1296A	Monitor northern boundary of deep leading edge plume lobe	TE	NS	
69MW1297	Monitor western plume boundary of leading edge deep plume lobe	TE	NS	
69MW1300A	Monitor leading edge lobes	TE	TE	EDB
69MW1300B	Monitor leading edge lobes	TE	TE	EDB
69MW1302	Monitor leading edge lobes	TE	NS	
69MW1303A	Monitor the plume downgradient of 69EW0001	A	A	EDB
69MW1303B	Monitor the plume downgradient of 69EW0001	A	A	EDB
69MW1304	Monitor the plume upgradient of 69EW0001	A	A	EDB
69MW1306A	Monitor core of leading edge deep plume lobe	A	A	EDB
69MW1306C	Monitor core of leading edge deep plume lobe	A	A	EDB
69MW1310	Monitor plume between the western arm of Coonamessett Pond and Hatchville Road	A	A	EDB
69MW1311	Monitor western plume boundary near the treatment plant	TE	NS	
69MW1312	Monitoring eastern plume boundary near Hatchville Road	TE	NS	
69MW1313	Monitor eastern plume boundary near between Coonamessett Pond and Hatchville Road	TE	NS	
69MW1314	Monitor eastern plume boundary north of Hatchville Road	TE	TE	EDB
69MW1315	Monitor western plume boundary north of Hatchville Road	A	A	EDB
69MW1316	Monitor western plume boundary north of Hatchville Road	TE	NS	
69MW1317A	Monitor the plume downgradient of 69EW0001 and upgradient of former SWPs	A	A	EDB
69MW1317B	Monitor the plume downgradient of 69EW0001 and upgradient of former SWPs	A	A	EDB
69MW1317C	Monitor the plume downgradient of 69EW0001 and upgradient of former SWPs	A	A	EDB
69MW1318A	Monitor northern portion of the uncaptured southern portion of the plume	A	A	EDB
69MW1400A	Monitor the northern part of the plume	TE	NS	
69MW1401	Monitor the northern part of the plume	TE	NS	
69MW1403	Monitor the northern part of the plume	TE	TE	EDB
69MW1404	Monitor the north western boundary of the plume	TE	NS	
69MW1411	Monitor the trailing edge of northern part of the main EDB plume	TE	NS	
69MW1416	Monitor the trailing edge of northern part of the main EDB plume	TE	NS	
69PZ0005B	Monitor shallow leading edge plume lobe	A	NS	
69PZ0017A	Monitor core of leading edge deep plume lobe	SA	A	EDB
69PZ0019B	Monitor shallow leading edge plume lobe	A	NS	
69PZ0020A	Monitor boundary of deep leading edge plume lobe upgradient of 69EW0002	TE	TE	EDB
69PZ0021A	Monitor boundary of deep leading edge plume lobe upgradient of 69EW0002	TE	TE	EDB
69PZ0023A	Monitor deep leading edge plume lobe (western boundary)	A	NS	
69PZ1286B	Monitor deep leading edge plume lobe (upper boundary)	A	A	EDB
69PZ1291A	Monitor the plume in the vicinity of the former SWPs	TE	NS	
69PZ1298A	Monitor shallow leading edge plume lobe	TE	NS	
69PZ1300A	Monitor shallow leading edge plume lobe	TE	TE	EDB
69PZ1302A	Monitor shallow leading edge plume lobe	TE	NS	
69PZ1308A	Monitor shallow leading edge plume lobe	TE	NS	
69PZ1403	Monitor shallower portion of northern plume	TE	TE	EDB
Surface Water Monitoring Network				
69SW0006	Monitor surface water flowing into the upper Baptiste Bog	2x	2x	EDB
69SW0010	Monitor surface water downstream of Bubbler #1	2x	2x	EDB
69SW0019	Monitor surface water in the Coonamessett River adjacent to former SWPs	2x	2x	EDB
69SW0046	Monitor surface water flowing out of the Adams bog	2x	2x	EDB
69SW0048	Monitor surface water flowing out of the East Thompson bog	2x	2x	EDB
69SW0049	Monitor surface water flowing south of Sandwich Road	2x	2x	EDB
69SW0060	Monitor surface water flowing out of the Augusta bog	2x	2x	EDB
69SW0527	Monitor surface water flowing out of the Pond 14	2x	2x	EDB
69SW2001	Monitor surface water flowing out into the Augusta bog	2x	2x	EDB
69SW2002	Monitor surface water flowing into the West Thompson bog	2x	2x	EDB
69SW2007	Monitor surface water flowing out of the Chaston bog	2x	2x	EDB

Key:
2x = 2 times during growing season (June, August)
A = annually
NS = not sampled
TE = triennially
CWSW = Coonamessett Water Supply Well
EDB = ethylene dibromide
SA = semiannually
SWP = shallow wellpoint

Table 2

Summary of EDB Groundwater Data at FS-28 Monitoring Wells and Piezometers Proposed for Removal from SPEIM Network

20 June 2012 Technical Update Meeting

Location	Date	EDB (µg/L) MMCL[1] = 0.02
69MW1272	2/18/1998	0.013
69MW1272	7/19/2001	0.013
69MW1272	4/26/2002	**0.045**
69MW1272	4/9/2003	**0.062**
69MW1272	5/24/2004	0.016
69MW1272	4/7/2005	0.019
69MW1272	4/11/2006	BRL
69MW1272	3/24/2009	BRL
69MW1272	2/14/2012	ND
69MW1278	2/10/1998	**0.025**
69MW1278	4/9/2003	**0.041**
69MW1278	5/21/2004	**0.059**
69MW1278	4/5/2005	**0.025**
69MW1278	4/13/2006	**0.035**
69MW1278	4/6/2009	ND
69MW1278	2/2/2012	ND
69MW1290A	12/30/1996	ND
69MW1290A	6/2/2006	ND
69MW1290A	4/8/2009	ND
69MW1290A	1/31/2012	ND
69MW1290B	12/30/1996	ND
69MW1290B	6/2/2006	ND
69MW1290B	4/8/2009	ND
69MW1290B	1/31/2012	ND
69MW1291B	11/18/1996	ND
69MW1291B	3/27/1998	ND
69MW1291B	8/18/1998	ND
69MW1291B	12/11/1998	ND
69MW1291B	5/12/1999	ND
69MW1291B	7/8/1999	ND
69MW1291B	9/24/1999	ND
69MW1291B	2/3/2000	ND
69MW1291B	4/17/2000	ND
69MW1291B	7/17/2000	ND
69MW1291B	1/15/2001	ND
69MW1291B	7/12/2001	ND
69MW1291B	10/19/2001	ND
69MW1291B	9/15/2003	ND
69MW1291B	3/25/2009	ND
69MW1291B	2/7/2012	ND
69MW1294	11/26/1996	**1.9**
69MW1294	10/6/1998	**2.98**
69MW1294	10/20/2000	**4.54**
69MW1294	4/16/2001	**0.197**
69MW1294	7/12/2001	**3.47**
69MW1294	10/19/2001	**0.063**
69MW1294	1/28/2002	0.014
69MW1294	4/25/2002	BRL
69MW1294	7/22/2002	**0.466**
69MW1294	10/30/2002	**1.36**
69MW1294	3/28/2003	**0.552**
69MW1294	6/9/2003	**0.174**
69MW1294	9/15/2003	BRL
69MW1294	1/5/2004	ND
69MW1294	5/12/2004	0.019
69MW1294	7/6/2004	BRL
69MW1294	9/29/2004	ND
69MW1294	4/4/2005	0.017
69MW1294	9/12/2005	BRL
69MW1294	4/12/2006	BRL
69MW1294	10/3/2006	BRL
69MW1294	4/24/2007	ND
69MW1294	9/27/2007	ND
69MW1294	7/1/2008	ND
69MW1294	4/23/2009	ND
69MW1294	2/9/2012	ND
69MW1296A	12/26/1996	**0.23**
69MW1296A	10/7/1998	ND
69MW1296A	4/16/2001	ND
69MW1296A	7/17/2001	ND
69MW1296A	10/19/2001	ND
69MW1296A	1/14/2002	ND

Table 2

Summary of EDB Groundwater Data at FS-28 Monitoring Wells and Piezometers Proposed for Removal from SPEIM Network

20 June 2012 Technical Update Meeting

Location	Date	EDB (µg/L) MMCL[1] = 0.02
69MW1296A	4/26/2002	BRL
69MW1296A	7/22/2002	ND
69MW1296A	10/30/2002	0.014
69MW1296A	1/23/2003	**0.103**
69MW1296A	3/28/2003	**0.031**
69MW1296A	6/9/2003	ND
69MW1296A	9/15/2003	ND
69MW1296A	12/29/2003	ND
69MW1296A	5/28/2004	ND
69MW1296A	7/13/2004	ND
69MW1296A	9/13/2004	ND
69MW1296A	4/6/2005	ND
69MW1296A	9/12/2005	ND
69MW1296A	4/12/2006	ND
69MW1296A	10/3/2006	ND
69MW1296A	4/24/2007	ND
69MW1296A	9/27/2007	ND
69MW1296A	4/8/2009	ND
69MW1296A	1/31/2012	ND
69MW1297	12/23/1996	ND
69MW1297	10/6/1998	ND
69MW1297	4/16/2001	ND
69MW1297	9/21/2004	ND
69MW1297	4/4/2005	ND
69MW1297	4/12/2006	ND
69MW1297	4/24/2007	ND
69MW1297	4/23/2009	ND
69MW1297	2/1/2012	ND
69MW1302	1/2/1997	ND
69MW1302	10/20/1997	ND
69MW1302	12/22/1997	ND
69MW1302	3/24/1998	ND
69MW1302	8/11/1998	ND
69MW1302	12/9/1998	**0.48**
69MW1302	5/10/1999	**0.073**
69MW1302	7/12/1999	**0.1**
69MW1302	9/24/1999	**0.022**
69MW1302	2/1/2000	**0.047**
69MW1302	3/23/2000	**0.13**
69MW1302	4/17/2000	**0.21**
69MW1302	5/19/2000	**0.137**
69MW1302	6/26/2000	**0.088**
69MW1302	7/17/2000	**0.255**
69MW1302	10/20/2000	0.011
69MW1302	1/17/2001	ND
69MW1302	4/17/2001	0.014
69MW1302	7/13/2001	BRL
69MW1302	10/17/2001	ND
69MW1302	1/14/2002	ND
69MW1302	4/26/2002	ND
69MW1302	7/29/2002	ND
69MW1302	10/30/2002	ND
69MW1302	1/21/2003	ND
69MW1302	3/26/2003	ND
69MW1302	6/10/2003	ND
69MW1302	9/15/2003	ND
69MW1302	1/5/2004	ND
69MW1302	4/21/2004	ND
69MW1302	7/2/2004	ND
69MW1302	9/29/2004	ND
69MW1302	4/8/2005	ND
69MW1302	8/19/2005	ND
69MW1302	9/15/2005	ND
69MW1302	4/11/2006	ND
69MW1302	10/3/2006	ND
69MW1302	4/24/2007	ND
69MW1302	9/27/2007	ND
69MW1302	3/19/2009	ND
69MW1302	2/1/2012	ND
69MW1311	3/5/1997	ND
69MW1311	9/29/2004	ND
69MW1311	4/6/2005	ND
69MW1311	4/14/2006	ND
69MW1311	4/8/2009	ND
69MW1311	1/31/2012	ND

Table 2

Summary of EDB Groundwater Data at FS-28 Monitoring Wells and Piezometers Proposed for Removal from SPEIM Network

20 June 2012 Technical Update Meeting

Location	Date	EDB (µg/L) MMCL[1] = 0.02
69MW1312	3/5/1997	0.019
69MW1312	9/30/2004	ND
69MW1312	4/6/2005	ND
69MW1312	4/7/2006	ND
69MW1312	4/8/2009	ND
69MW1312	1/31/2012	ND
69MW1313	3/7/1997	ND
69MW1313	5/24/2004	ND
69MW1313	7/8/2004	ND
69MW1313	9/30/2004	ND
69MW1313	4/6/2005	ND
69MW1313	4/7/2006	ND
69MW1313	4/23/2009	ND
69MW1313	2/9/2012	ND
69MW1316	2/20/1998	ND
69MW1316	6/2/2006	ND
69MW1316	4/1/2009	ND
69MW1316	1/31/2012	ND
69MW1400A	1/14/1998	**0.085**
69MW1400A	4/21/1999	**0.05**
69MW1400A	7/18/2001	**0.061**
69MW1400A	4/25/2002	**0.061**
69MW1400A	4/9/2003	**0.044**
69MW1400A	5/24/2004	0.02
69MW1400A	4/6/2005	0.017
69MW1400A	4/12/2006	0.013
69MW1400A	4/6/2009	BRL
69MW1400A	2/14/2012	ND
69MW1401	1/15/1998	**0.57**
69MW1401	4/21/1999	**0.885**
69MW1401	7/20/2001	**0.186**
69MW1401	4/25/2002	**0.258**
69MW1401	4/9/2003	**0.129**
69MW1401	5/24/2004	**0.104**
69MW1401	4/6/2005	**0.065**
69MW1401	4/12/2006	**0.046**
69MW1401	4/23/2009	BRL
69MW1401	2/14/2012	ND
69MW1404	2/10/1998	ND
69MW1404	7/18/2001	ND
69MW1404	4/26/2002	ND
69MW1404	4/28/2003	ND
69MW1404	5/24/2004	ND
69MW1404	4/5/2005	ND
69MW1404	4/12/2006	ND
69MW1404	4/6/2009	ND
69MW1404	2/16/2012	ND
69MW1411	2/11/1998	**0.027**
69MW1411	4/27/1999	**0.035**
69MW1411	7/18/2001	**0.030**
69MW1411	4/25/2002	0.012
69MW1411	4/9/2003	ND
69MW1411	5/24/2004	ND
69MW1411	4/6/2005	0.01
69MW1411	4/13/2006	0.011
69MW1411	4/6/2009	BRL
69MW1411	2/29/2012	ND
69MW1416	2/10/1998	0.016
69MW1416	10/12/2000	ND
69MW1416	7/19/2001	0.014
69MW1416	4/26/2002	**0.022**
69MW1416	4/9/2003	0.011
69MW1416	5/24/2004	0.011
69MW1416	4/7/2005	0.018
69MW1416	6/22/2006	0.011
69MW1416	4/6/2009	ND
69MW1416	2/9/2012	ND
69PZ0005B	6/9/2006	ND
69PZ0005B	9/28/2006	ND

Table 2

Summary of EDB Groundwater Data at FS-28 Monitoring Wells and Piezometers Proposed for Removal from SPEIM Network

20 June 2012 Technical Update Meeting

Location	Date	EDB (µg/L) MMCL[1] = 0.02
69PZ0005B	4/18/2007	ND
69PZ0005B	9/24/2007	ND
69PZ0005B	4/7/2009	ND
69PZ0005B	1/13/2010	ND
69PZ0005B	3/14/2011	ND
69PZ0005B	2/15/2012	ND
69PZ0019B	6/6/2006	**0.023**
69PZ0019B	9/28/2006	**0.061**
69PZ0019B	4/18/2007	**0.027**
69PZ0019B	9/24/2007	0.016
69PZ0019B	4/7/2009	ND
69PZ0019B	1/13/2010	ND
69PZ0019B	2/23/2011	ND
69PZ0019B	2/13/2012	ND
69PZ0023A	9/24/2007	ND
69PZ0023A	4/8/2009	ND
69PZ0023A	2/2/2010	ND
69PZ0023A	3/14/2011	ND
69PZ0023A	2/29/2012	ND
69PZ1291A	4/9/2003	ND
69PZ1291A	8/27/2003	ND
69PZ1291A	9/15/2003	ND
69PZ1291A	12/29/2003	ND
69PZ1291A	5/12/2004	ND
69PZ1291A	7/21/2004	ND
69PZ1291A	9/13/2004	ND
69PZ1291A	4/13/2007	ND
69PZ1291A	7/1/2008	ND
69PZ1291A	3/25/2009	BRL
69PZ1291A	2/29/2012	ND
69PZ1298A	8/18/2005	ND
69PZ1298A	6/6/2006	ND
69PZ1298A	9/27/2006	ND
69PZ1298A	4/13/2007	ND
69PZ1298A	9/27/2007	ND
69PZ1298A	3/25/2009	ND
69PZ1298A	2/16/2012	ND
69PZ1302A	8/19/2005	**0.027**
69PZ1302A	4/11/2006	ND
69PZ1302A	9/27/2006	ND
69PZ1302A	4/13/2007	ND
69PZ1302A	9/27/2007	ND
69PZ1302A	3/19/2009	ND
69PZ1302A	2/29/2012	ND
69PZ1308A	8/18/2005	ND
69PZ1308A	6/6/2006	ND
69PZ1308A	9/27/2006	ND
69PZ1308A	4/13/2007	ND
69PZ1308A	9/27/2007	ND
69PZ1308A	4/1/2009	ND
69PZ1308A	2/16/2012	ND

Data Source: AFCEE, June 2012, MMR-AFCEE Data Warehouse

Notes:

1. MMCL from Massachusetts Department of Environmental Protection (MassDEP) web page, http://www.mass.gov/dep/water/dwstand.pdf.

Bold values represent EDB concentrations above the MMCL.

Key:

BRL = below the reporting limit

EDB = ethylene dibromide

FS-28 = Fuel Spill-28

MMCL = Massachusetts Maximum Contaminant Level

ND = not detected

µg/L = micrograms per liter

FS-28 Triennial SPEIM Data Presentation

Conclusions

- SPEIM data continue to support conclusion that 69EW0001 is successfully capturing the main FS-28 EDB plume.
- The observed decline in 69EW0001 influent concentrations over past several years likely attributed to overall decline in EDB concentrations within the plume.
- Maximum detected EDB concentration in main body of the plume now 0.933 µg/L (declining from 1.71 µg/L in 2010 and 1.1 µg/L in 2011).
- EDB data from wells near the former the SWP system continues to support the decision to cease operation of SWP system in November 2008.
- No EDB detections in wells selected to monitor the deep leading edge lobe suggest a contiguous plume no longer exists; however influent EDB concentrations at 69EW0002 indicate MMCL exceedances do remain in the aquifer.
- Surface water data collected in 2011 did not identify need to sample cranberries.

FS-28 Triennial SPEIM Data Presentation

Conclusions (cont.)

- ETD System performance monitoring data consistent with CSM, remedial goals are being met, and remediation is progressing as expected; no system operation changes needed at this time.
- Monitoring network optimization warranted based on multiple rounds of sub-MMCL or no EDB detections at 25 locations; adjustment to monitoring frequency at 7 locations (Figure 10 and Table 1)
- Minor plume boundary revisions are needed (Figure 10) but does not result in a change to the FS-28 LUC boundary.

FS-28 Triennial SPEIM Data Presentation

Recommendations

- Update FS-28 plume boundary as depicted on Figure 10
- Optimize the SPEIM groundwater monitoring network (Table 1)
- AFCEE will continue with following planned SPEIM activities:
  - Perform surface water monitoring in June and August 2012
  - Perform annual Coonamessett Water Supply Well sentry well sampling in October 2012
  - Perform annual SPEIM sampling event in February 2013
  - Perform routine monthly remedial system performance monitoring
  - Present sampling results at Technical Update meetings

ATTACHMENT B

Regulatory Approval of the FS-28 SPEIM Monitoring Network Optimization Recommendations

-----Original Message-----
From: Robert Lim [mailto:Lim.Robert@epamail.epa.gov]
Sent: Thursday, July 05, 2012 11:15 AM
To: FORBES, ROSE H GS-13 USAF AETC EXE; elliot.jacobs@state.ma.us
Subject: FS-28 Proposed MW Network

Hi Rose,

I've gone over Table 1 and am OK with the network proposals for optimizing the frequecies.

~Bob

USEPA
5 Post Office Square Suite 100
(Mailcode: OSRR07-3)
Boston, MA 02109-3912
ph 617-918-1392 | fax 617-918-0392

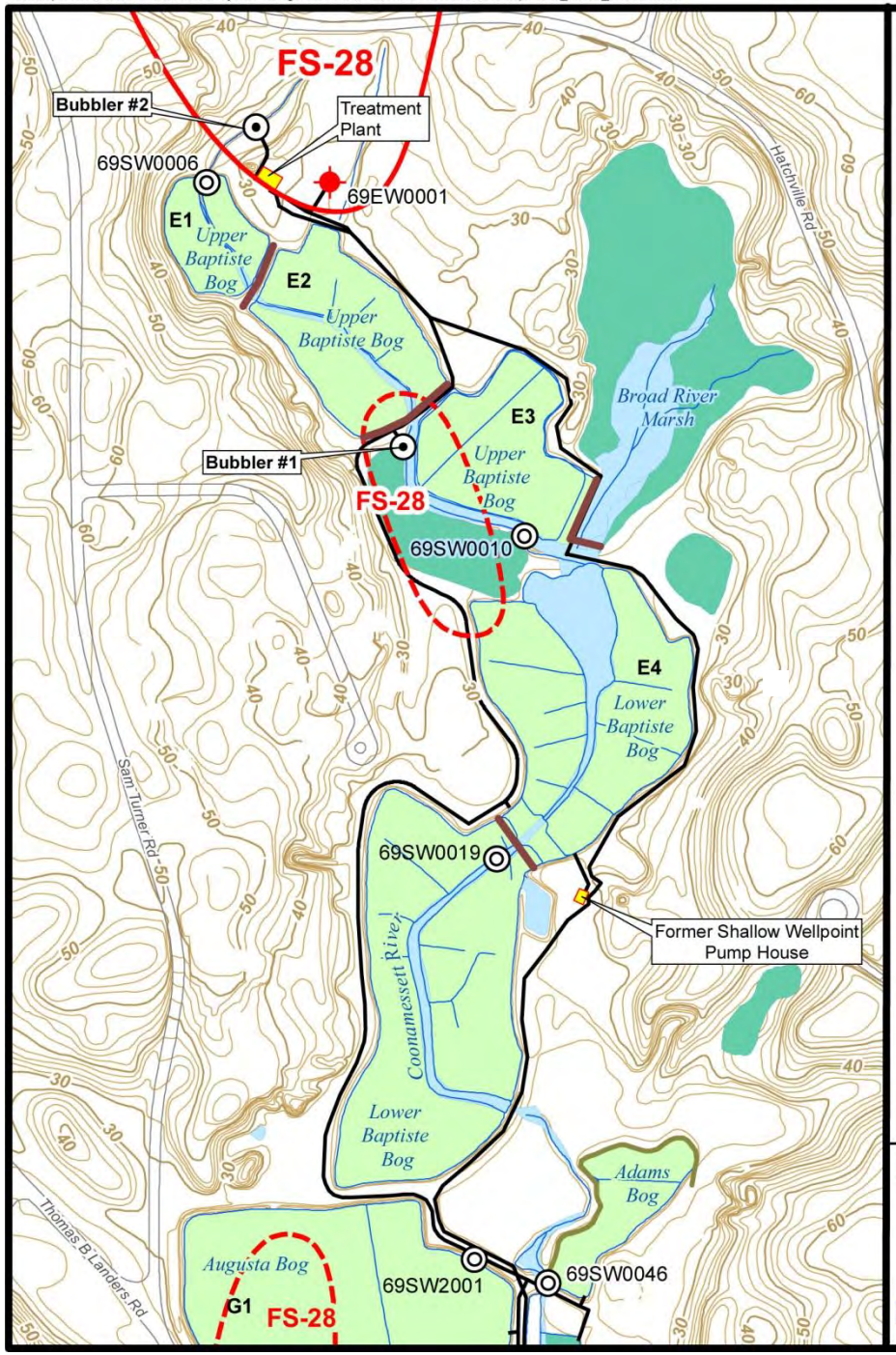
-----Original Message-----
From: Jacobs, Elliot (DEP) [mailto:elliot.jacobs@state.ma.us]
Sent: Friday, June 22, 2012 9:33 AM
To: FORBES, ROSE H GS-13 USAF AETC EXE
Cc: Pinaud, Leonard (DEP); Robert Lim; DAVIS, JONATHAN S GS-14 USAF AETC EXE
Subject: FS-28 Chemical Monitoring Network Optimization

MassDEP has reviewed the AFCEE's proposed optimization of the FS-28 chemical monitoring network presented in Table 1 of the FS-28 2012 Triennial SPEIM Data Presentation provided to the regulatory agencies at the June 20, 2012 Technical Update Meeting. MassDEP concurs with all of the revisions to the FS-28 chemical monitoring network proposed by AFCEE. MassDEP appreciates being provided with a data summary table (Table 2) with the complete monitoring history for each of the 25 monitoring wells proposed for elimination from the FS-28 chemical monitoring network. This table greatly facilitated and expedited MassDEP's review of the optimization proposal, and MassDEP recommends that a similar data table be provided for any monitoring point currently in the AFCEE's IRP SPEIM Program recommended for elimination in the future.

Elliott Jacobs, MassDEP - BWSC SERO
508-946-2786

ATTACHMENT C

FS-28 Surface Water Results, June and August 2012



FS-28 Surface Water Results
June and August 2012
27 September 2012 Technical Update Meeting

EDB Concentrations (µg/L)

69SW0006

09/04/09	**ND**
05/26/10	**ND**
07/15/10	**ND**
09/01/10	**ND**
06/07/11	**ND**
08/11/11	**ND**
06/11/12	**ND**
08/20/12	**ND**

69SW0010

09/04/09	**ND**
09/21/09	**ND**
05/26/10	**ND**
07/15/10	**ND**
09/01/10	**ND**
06/07/11	**ND**
08/11/11	**ND**
06/11/12	**ND**
08/20/12	**ND**

69SW0019

09/04/09	**ND**
09/21/09	**ND**
05/26/10	**ND**
07/15/10	**ND**
09/01/10	**ND**
06/07/11	**ND**
08/11/11	**ND**
06/11/12	**ND**
08/20/12	**ND**

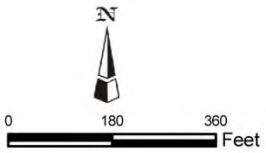
69SW0046

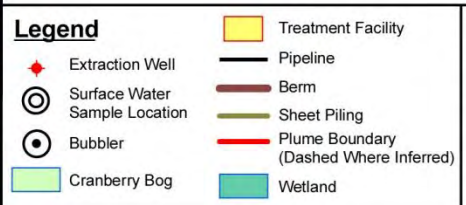
09/04/09	**ND**
09/21/09	**ND**
05/26/10	**ND**
07/15/10	**ND**
09/01/10	**ND**
06/07/11	**ND**
08/11/11	**ND**
06/11/12	**ND**
08/20/12	**ND**

69SW2001

09/04/09	**ND**
09/21/09	**ND**
05/26/10	**ND**
07/15/10	**ND**
09/01/10	**ND**
06/07/11	**ND**
08/11/11	**ND**
06/11/12	**ND**
08/20/12	**ND**

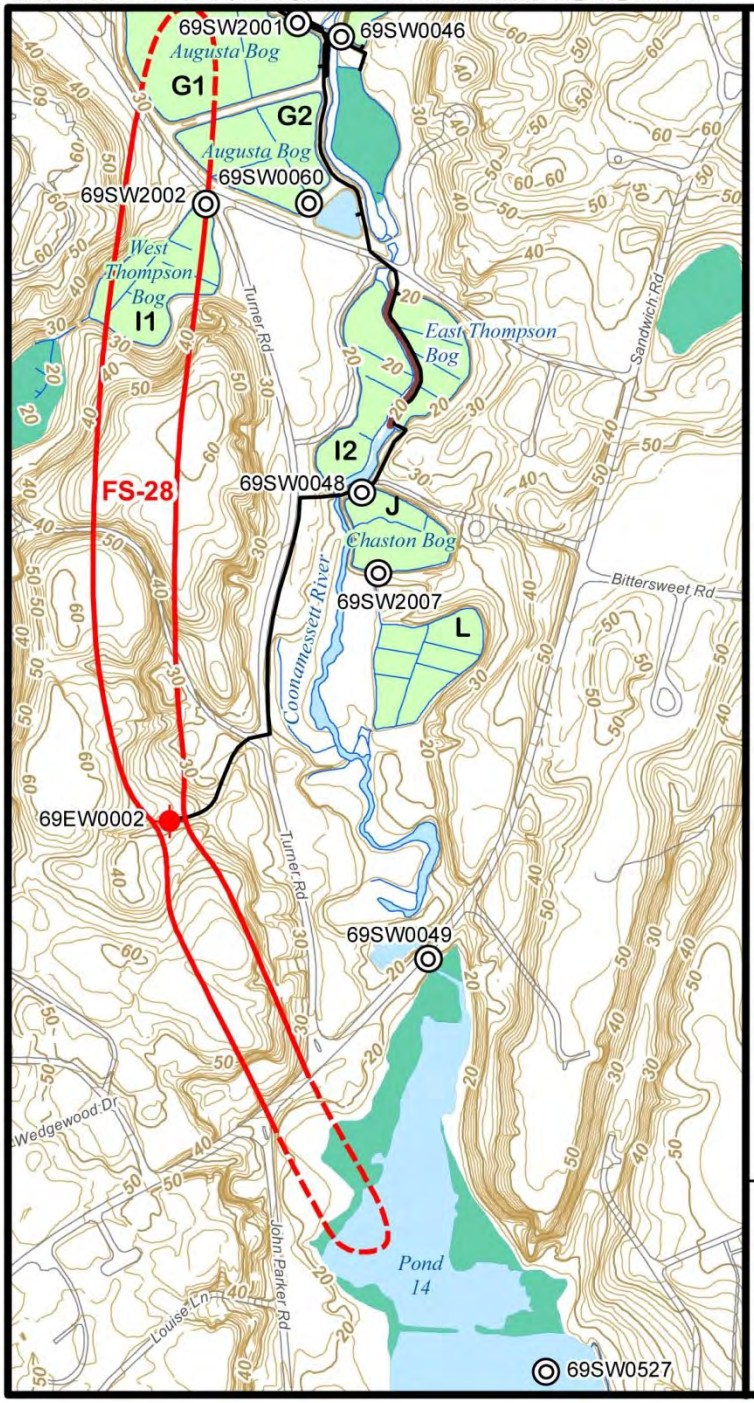
ND: Not Detected





COONAMESSETT RIVER BOGS SURFACE WATER SAMPLE LOCATIONS

AFCEE - Massachusetts Military Reservation



EDB Concentrations (µg/L)

69SW0048

09/04/09	**ND**
05/26/10	**ND**
07/15/10	**ND**
09/01/10	**ND**
06/07/11	**ND**
08/11/11	**ND**
06/11/12	**ND**
08/20/12	**ND**

69SW0049

09/04/09	**ND**
05/26/10	**ND**
07/15/10	**ND**
09/01/10	**ND**
06/07/11	**ND**
08/11/11	**ND**
06/11/12	**ND**
08/20/12	**ND**

69SW0060

09/04/09	**ND**
05/26/10	**ND**
07/15/10	**ND**
09/01/10	**ND**
06/07/11	**ND**
08/11/11	**ND**
06/11/12	**ND**
08/20/12	**ND**

69SW2002

09/04/09	**ND**
05/26/10	**ND**
07/15/10	**ND**
09/01/10	**ND**
06/07/11	**ND**
08/11/11	**ND**
06/11/12	**ND**
08/20/12	**ND**

69SW2007

09/04/09	**ND**
05/26/10	**ND**
07/15/10	**ND**
09/01/10	**ND**
06/07/11	**BRL**
08/11/11	**ND**
06/11/12	**ND**
08/20/12	**ND**

69SW0527

09/04/09	**ND**
05/26/10	**ND**
07/15/10	**ND**
09/01/10	**ND**
06/07/11	**ND**
08/11/11	**ND**
06/11/12	**ND**
08/20/12	**ND**

ND: Not Detected
BRL: Below Reporting Limit of 0.01 micrograms per liter (µg/L)

N

0 290 580 Feet

Legend

- Surface Water Sample Location
- Cranberry Bog
- Wetland
- Pipeline
- Berm
- Sheet Piling
- Plume Boundary (Dashed Where Inferred)

COONAMESSETT RIVER BOGS SURFACE WATER SAMPLE LOCATIONS

AFCEE - Massachusetts Military Reservation